
Air Installation Compatible Use Zone Study

FOR THE
UNITED STATES AIR FORCE ACADEMY



United States Air Force Academy,
Aardvark Auxiliary Airfield, and
Bullseye Auxiliary Airfield, Colorado



January 2005

Acronyms and Abbreviations

AFB	Air Force Base	IFR	Instrument Flight Rules
AICUZ	Air Installation Compatible Use Zone	IFT	Individual Flight Training
ANG	Air National Guard	MSL	mean sea level
APZ	Accident Potential Zone	NLR	Noise Level Reduction
ATC	air traffic control	NM	Nautical miles
CZ	Clear Zone	SEL	Sound Exposure Level
dB	decibels	SLUCM	Standard Land Use Coding Manual
DNL	Day-Night Average A-Weighted Sound Level	U.S.	United States
DOD	Department of Defense	USAF	United States Air Force
FAA	Federal Aviation Administration	USAFA	United States Air Force Academy
FAR	Federal Aviation Regulation	VFR	Visual Flight Rules
HUD	U.S. Department of Housing and Urban Development		

MEMORANDUM FOR AREA GOVERNMENTS

FROM: 10 CES/CEP
8120 Edgerton Drive, Suite 40
United States Air Force Academy, Colorado 80840

SUBJECT: Air Installation Compatible Use Zone Study

This Air Installation Compatible Use Zone (AICUZ) Study for the United States Air Force Academy (USAFA) is an update to the AICUZ Study prepared in July 1999. This update was initiated because of changes in various aircraft especially the T-3 to Diamond DV20-C1 Falcon, alterations in flight tracks and changes in flight-track utilization, and technical improvements to the noise-modeling program. This study represents a reevaluation of aircraft noise and accident potential related to military flying operations. It is designed to help local planning officials protect public safety and health, as well as preserve the operational capabilities of the USAFA, Aardvark Auxiliary Airfield, and Bullseye Auxiliary Airfield.

The objective of the AICUZ program is to achieve compatible uses of public and private lands in the vicinity of military airfields by controlling incompatible development through local actions. This report provides the information necessary to maximize beneficial use of the land surrounding the main airfield at the USAFA, Aardvark Auxiliary Airfield, and Bullseye Auxiliary Airfield while minimizing the potential for degradation of the health and safety of the affected public.

This Study contains a description of the location of airfield clear zones, accident potential zones, noise contours, and recommends compatible land uses for communities in the vicinity of the base and its auxiliary airfield. It is our hope that this information will be incorporated into your community plans, zoning ordinances, subdivision regulations, and building codes.

We value greatly the positive relationship between USAFA and its neighbors and appreciate efforts by the City of Colorado Springs and El Paso County to incorporate previous AICUZ recommendations into their planning process. As a partner in these plans, we have attempted to minimize noise disturbances through such actions as minimizing night flights and avoiding flights over heavily populated areas. We solicit your cooperation in implementing the recommendations and guidelines presented in this AICUZ Study.

Colonel John G. Miller
United States Air Force Academy

Date

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FOR THE
UNITED STATES AIR FORCE ACADEMY



**United States Air Force Academy,
Aardvark Auxiliary Airfield, and
Bullseye Auxiliary Airfield, Colorado**

JANUARY 2005

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1. Air Installation Compatible Use Zone Study

1.1 Introduction

This document presents the United States Air Force Academy (USAFA) Air Installation Compatible Use Zone (AICUZ) Study. It reaffirms United States Air Force (USAF) policy of promoting public health, safety, and general welfare in areas surrounding USAF installations around the country. This report presents changes in flight operations and provides current noise contours and compatible land use guidelines for areas surrounding the USAFA and the Bullseye Auxiliary Airfield. It is hoped this information will assist the local communities and serve as a tool for future planning and zoning activities. At the USAFA, the Base Comprehensive Planner has been designated the official liaison with the local community on all planning matters. This person can be reached at (719) 333-8408.

This AICUZ Study is an update to the study published in 1999. Differences between this Study and the previous study result from:

- Addition, elimination, or alteration of flight tracks for mission purposes or to avoid over-flying populated areas,
- Accurate depictions of the Clear Zones (CZs) and Accident Potential Zones (APZs) for all runways owned and operated by the USAFA, which include the four runways located at the USAFA's Airfield and one runway each at Aardvark and Bullseye Auxiliary Airfields.
- Consideration of incompatible land uses in these areas that have not been publicly acknowledged before, and
- Technical improvements to the NOISEMAP program.

1.2 Purpose and Need

The purpose of the USAF AICUZ program is to promote compatible land development in areas subject to aircraft noise and accident potential. USAF AICUZ Land Use Guidelines reflect land use recommendations for CZs and APZs I and II as well as applicable noise zones. These guidelines have been established on the basis of studies prepared and sponsored by several federal agencies, including the Department of Housing and Urban Development, U.S. Environmental Protection Agency, Federal Aviation Administration (FAA), USAF, and state and local agencies. The guidelines recommend land uses which are compatible with airfield operations while allowing maximum beneficial use of adjacent properties. This study contains guidelines that were developed to assist local planning entities in determining land uses that are compatible with the USAFA Airfield environs. As planners for the City of Colorado Springs, the Town of Monument and El Paso County modify current land use and zoning plans, recommendations from this study should be considered to prevent

incompatibilities that may compromise the USAFA's ability to fulfill its mission or subject local residents to avoidable safety hazards. APZs should be primary considerations in the planning process for areas adjacent to the USAFA.

1.3 Process and Procedure

The AICUZ program uses the latest technology to define noise levels based on a wide spectrum of data in areas near USAF installations. An analysis of the USAFA's flying operations was performed which included types of aircraft, flight patterns utilized, variations in altitude, power settings, number of operations, and hours of operation. An operation is defined as any takeoff (departure), landing (arrival), or individual climbout and descent portion of a closed pattern such as a touch-and-go or missed approach. This information was used to develop the noise zones contained in this study. The day-night average A-weighted sound level (DNL) methodology was used to define the noise zones for the USAFA.

Preparation and presentation of the USAFA's AICUZ Study is part of the continuing USAF participation in the local planning process. It is recognized that, as local communities prepare or revise land use plans and zoning ordinances, the USAF has the responsibility to provide inputs on flight activities that affect areas adjacent to the installation. This study is presented in the spirit of mutual cooperation and assistance by the USAFA to aid in the local land use planning process. Noise contours and AICUZ maps in this study are based on installation mission plans. Operations and aircraft data were collected and verified in January 2003. Aircraft activity and maintenance data were obtained to derive average daily operations, by runway and type of aircraft. Data are supplemented by flight track information (where they fly), flight profile information (how they fly), and ground runoff information. After verification for accuracy, data were input to the NOISEMAP 6.5 software program and converted into DNL noise contours. Contours were plotted and overlaid on an area map that included CZs and APZs associated with each of the USAFA's runways. Appendix A contains detailed information on the development of the AICUZ program.

2. Installation Description

2.1 Mission

The USAFA's mission:

Inspire and develop outstanding young men and women to become Air Force officers with knowledge, character, and discipline; motivated to lead the world's greatest aerospace force in service to the nation.

The Bullseye Auxiliary Airfield and the Farish Recreation Area are two detached properties that support the Academy mission. The USAF built Bullseye Auxiliary Airfield approximately 30 miles east of Colorado Springs in 1987-88 due to congested conditions at the Main Airfield. This airfield is located within a large section of land managed by The Nature Conservancy. Bullseye Auxiliary Airfield contains one 6,036 foot runway, associated parking ramps and taxiways, a fire station, and two runway supervisory units. The Farish Recreation Area, located approximately 15 miles due north of Pikes Peak, has been owned and operated as an off-base military recreation area since 1959 when a 60-acre parcel containing two lodges was donated to the USAFA. Today, the Farish property includes 655 acres of interspersed forested ridges, small valleys, and rolling meadows with 26 campsites, seven picnic pavilions, and four camper cabins to meet the recreation needs of the Academy community.

2.2 History

The USAFA, established in 1954, moved to 18,445 acres north of Colorado Springs in 1958 following a site-selection process that considered hundreds of sites across the United States (Figure 2-1). The USAFA is a one-base major command with all the facilities and organizational structures common to an Air Force base. Superimposed upon this structure are the facilities required for a four-year college which seeks to produce well-rounded and technically proficient career Air Force officers. As of January 2003, total cadet strength at the USAFA was 4,338. In addition to the academic curriculum, cadets may pursue flight training.

January 2005

2.3 Economic Impact

The USAFA has historically played a substantial role in the economic picture of El Paso County, Colorado. Although all of the cadets live on base, nearly all of the civilian employees and over half of the military personnel live off base, and thereby contribute greatly to the local economy.

2.3.1 Population

Colorado Springs has experienced strong population growth similar to that of other Rocky Mountain states. The Rocky Mountain region (which generally includes Colorado, Wyoming, Montana, Idaho, Utah, and New Mexico) had outpaced the nation as a whole in job and population growth since 1990. From 1995 to 2000 the population in Colorado Springs had increased by 10 percent while employment rose. Population then experienced declines beginning in 2001. After September 11, 2001, El Paso County and Colorado Springs experienced a significant number of layoffs, particularly in the technical industries. This factor has slowed overall growth in the region. Table 2-1 shows population trends for the City of Colorado Springs and El Paso County. Continued steady population growth is projected through the year 2020.

Table 2-1. Population Statistics

Population	City of Colorado Springs	El Paso County (MSA)
1970	135,501	235,972
1980	215,150	309,424
1990	281,140	397,014
1995	325,605	466,172
2000	358,400	511,457
2010 Projection	422,800	604,000
2020 Projection	475,900	681,500

Source: U.S. Air Force Academy 2003, General Plan Update 2003

2.3.2 Economy

In 2000, unemployment figures reached a 30-year low point. Since that time, unemployment has increased in the U.S., Colorado, and El Paso County. In 2001, the unemployment rate has slightly increased. Colorado's unemployment rate continues to rise and stands at 5.2 percent.

Much of the slowdown in the economy and employment is attributed to the decline in the number of jobs in the technology sector. This key sector along with the national economy has weakened the Colorado Springs economy. Preliminary figures estimate the Colorado Springs labor force grew by 2.86 percent from July 2001 to July 2002. Over the same period, employment grew by only 1.29 percent.

In 1990, military employment represented approximately 24.1 percent of El Paso County employment. Currently, total military employment represents approximately 18 percent of El Paso County employment. Table 2-2 shows the military employee breakdown for Colorado. Active duty and civilian employment at military establishments has increased 4 percent between 2000 and 2001. While still very important, the military impact on the economy has declined as other economic sectors have increased in employment and importance.

Payroll to military and civilian employees was up 6.7 percent from 2000. Total annual expenditures by the military in Colorado Springs were \$736.1 million. In 2001, the dollar value of indirect jobs created by the military presence in Colorado Springs was \$599 million.

Tables 2-3 to 2-6 summarize USAFA's economic contributions to El Paso County. The total economic impact on this region totals approximately \$2.64 billion, with an estimated 9,578 Academy military and civilian jobs generating 3,286 indirect jobs in the local economy. The estimated annual dollar value of jobs created is approximately \$107 million.

Table 2-2. Military Employee Breakdown

Fiscal Year 2001	Military	Civilian	Contractors	Total Employees
Fort Carson	15,159	1,854	1,034	18,047
Peterson AFB	6,225	5,425	1,871	9,969
U.S. Air Force Academy	6,410	1,793	1,375	9,578
Dependents Living On-Base	1,028			
Dependents Living Off-Base	1,137			
Schriever AFB	2,107	475	1,496	4,078

Source: U.S. Air Force Academy 2003, General Plan Update 2003

AFB: Air Force Base

Table 2-3. Payroll by Classification

Classification	Total
Active Duty Military	
Active Duty	\$95,857,951
ANG/Reserve	\$0
Trainees/Cadets	\$41,227,753
Non-Extended Active Duty ANG/Reserves	\$0
<i>Subtotal</i>	<i>\$137,085,704</i>
Appropriated Fund Civilians	
General Schedule	\$55,562,218
Federal Wage Board	\$29,261,483
Other	\$6,085,649
<i>Subtotal</i>	<i>\$90,909,350</i>
Non-Appropriated Fund Contract Civilians and Private Business	
Civilian Non-Appropriated Funds	\$13,237,718
Civilian Base Exchange	\$2,481,544
Contract Civilians (not elsewhere included)	\$858,046
Private Businesses on base	\$711,790
<i>Subtotal</i>	<i>\$17,289,098</i>
Total Annual Payroll	\$245,284,152

Source: U.S. Air Force Academy 2003, General Plan Update 2003

ANG: Air National Guard

Table 2-4. Estimate of Number/Dollar Value of Indirect Jobs Created (Fiscal Year 2001)

Type of Personnel	Number of Base Jobs	Multiplier	Number of Indirect Jobs
Active Duty	2,072	.41	850
Reserve/ANG/Trainees	4,338	.16	694
Appropriated Fund Civilians	1,793	.55	986
Other Civilians	1,375	.55	756
Total	9,578		3,286

Source: U.S. Air Force Academy 2003, General Plan Update 2003.

Table 2-5. Expenditures for Construction, Services and Procurement of materials, Equipment and Supplies (Fiscal Year 2001)

Classification	Annual Expenditure
Operating/Construction Contract Expenditure	
Military Construction Program	\$15,990,000
Non-Appropriated Fund	\$261,269
Military Family Housing	\$1,147,175
Operations & Maintenance	\$39,625,124
Other	\$656,110
<i>Subtotal</i>	<i>\$57,679,678</i>
Services	
Services Contracts	\$45,200,000
Other Services (not elsewhere reported)	\$0
<i>Subtotal</i>	<i>\$45,200,000</i>
Materials, Equipment and Supplies Procurement	
Commissary	\$6,857,544
Base Exchange (BX)	\$400,000
Health (Champus, Government cost only)	\$12,464,372
Education (impact aid and tuition assistance)	\$2,606,918
Temporary Duty	\$348,036
Other Materials, Equipment & Supplies (not elsewhere reported)	\$56,564,832
<i>Subtotal</i>	<i>\$79,241,702</i>
Total	\$182,121,380

Source: U.S. Air Force Academy 2003, General Plan Update 2003

Note Includes only contracts in the local economic area or contracts requiring the use of locally supplied goods and services.

Table 2-6. Total Annual Economic Impact Estimate Fiscal Year 2001

Classification	Economic Impact
Annual Payroll	\$245,284,152
Estimated Annual Dollar Value of Jobs Created	\$107,304,330
Annual Expenditures	\$182,121,380
Total	\$534,709,862

Source: U.S. Air Force Academy 2003, General Plan Update 2003

2.4 Flying Activity

The USAFA has changed some of the types of aircraft they operate. Table 2-7 depicts the changes that have occurred since the 1998 AICUZ Study. These aircraft substitutions have been approved by the AICUZ Group at the Air Force for Environmental Excellence.

The total daily departures arrivals, and closed patterns were modified from the 1998 AICUZ Study by 34 OSS/OSO personnel base on data collected from the USAFA aircraft operators. No changes were made to the flight tracks or flight profiles for these new aircraft types based on the substitutions listed in Table 2-7. More detailed information regarding the extent of any changes in flight operational data that may have occurred since the last USAFA AICUZ Study (July 1999) and the documented changes made in developing the noise analysis for this AICUZ Study is provided in the *AICUZ Resource Book for the USAFA* dated June 2003.

USAFA is encompassed by Class D airspace up to 2,500 feet above mean sea level (MSL). It is surrounded by an Alert Area (A-260). A total of 309,052 annual airfield operations were assessed for USAFA in 2003. Diamond DA20-C1 Falcon aircraft accounted for 149,760 of the 309,052 airfield operations. Table 2-8 summarizes the airfield operations at USAFA.

Table 2-7. USAFA Aircraft Types and NOISEMAP Substitutions

1998 AICUZ Study		2003 AICUZ Study Update	
Aircraft Type	NOISEMAP Substitute	New Aircraft Type	NOISEMAP Substitute
Firefly (T-3A)	T-3 (Firefly)	Diamond DA20-C1 Falcon	T-41
Cessna 172 (T-41 C/D)	T-41		T-41
Twin Otter (UV-18)	INM69 DH-6	DeHaviland UV-18B Twin Otter	INM69 DH-6
Gliders & Motor Gliders – Schweizer 1-26 (TG-3), Schweizer 2-33 (TG-4A), Schweizer 2-37 (TG-7), Alexander Schleicher ASK-21 (TG-9), Stemme S-10V (TG-11),	INM75 1-ENG	Gliders & Motor Gliders – L-23 Super Blanik (TG-10B), Blanik L-13AC (TG-10C), Blanik L-33 Solo (TG-10D), Stemme S-10V (TG-11), AMT 200S Super Ximango (TG-14)	INM75 1-ENG
Piper Tomhawks (172)	INM75 1-ENG	Cessna C-150/Cessna 172/Cessna 182/T-41	INM75 1-ENG
Cessna 150 (150)	INM75 1-ENG	Cessna C-150/Cessna 172/Cessna 182/T-41	INM75 1-ENG
Blanca Scout (TOW)	INM75 1-ENG	Johnson Super Cub	INM75 1-ENG

Table 2-8. Summary of Airfield Operations at USAFA and Aardvark Auxiliary Airfield

Aircraft	Number of Daily Operations			Annual Total
	Day	Night	Total	
Primary IFT Trainer (Diamond DV20-C1 Falcon)				
Total T-3 (Firefly) Arrival	72.00	0.00	72.00	
Total T-3 (Firefly) Departure	68.38	3.62	72.00	
Total T-3 (Firefly) Closed Pattern	216.00	0.00	216.00	149,760
Flying Team & Aero Club (Cessna 150, 172, 182, T-41 [T-41 C/D])				
Total T-41 Arrival	22.00	0.00	22.00	
Total T-41 Departure	21.63	0.37	22.00	
Total T-41 Closed Pattern	74.00	0.00	74.00	49,920
Jump Training (DeHaviland UV-18B Twin Otter)				
Total INM69 DH-6 Arrival	1.60	0.00	1.60	
Total INM69 DH-6 Departure	1.60	0.00	1.60	
Total INM69 DH-6 Closed Pattern	12.00	0.00	12.00	7,072
Gliders (TG-10B, TG-10C, TG-10D) & Motorcliders (TG-11, TG-14)				
Total INM75 1-ENG Arrival	15.86	0.00	15.86	
Total INM75 1-ENG Departure	15.86	0.00	15.86	
Total INM75 1-ENG Closed Pattern	63.00	0.00	63.00	41,007
Piper Super Cub (172)				
Total INM75 1-ENG Arrival	15.44	0.00	15.44	
Total INM75 1-ENG Departure	14.94	0.50	15.44	
Total INM75 1-ENG Closed Pattern	11.43	0.00	11.43	13,972
Flying Team & Aero Club (CESSNA 150, 172, 182, T-41 [T-41 C/D])				
Total INM75 1-ENG Arrival	0.00	0.00	0.00	
Total INM75 1-ENG Departure	0.00	0.00	0.00	
Total INM75 1-ENG Closed Pattern	10.00	0.00	10.00	5,200
Tow Plane (Johnson Super Cub)				
Total INM75 1-ENG Arrival	12.15	0.00	12.15	
Total INM75 1-ENG Departure	12.15	0.00	12.15	
Total INM75 1-ENG Closed Pattern	68.85	0.00	68.85	42,120
Total INM75 1-ENG				
Total INM75 1-ENG Arrival	43.45	0.00	43.45	
Total INM75 1-ENG Departure	42.95	0.50	43.45	
Total INM75 1-ENG Closed Pattern	153.28	0.00	153.28	102,300
USAFA Airfield and Aardvark Auxiliary Airfield Operations				
Flying Days Per Year				260
Total Annual Airfield Operations in 2003				309,052

Aircraft operations at the USAFA account for between 12 and 14 percent of all traffic handled by the Colorado Springs FAA Air Traffic Control (ATC) Tower¹. The majority of the local training activities are conducted within a 30 nautical mile (NM) radius of the USAFA. Training activities are also conducted at Bullseye Auxiliary Airfield, Colorado Springs Airport, Butts Army Airfield, Centennial Airport, and Pueblo Airport.

2.4.1 Base Operations

A vicinity map of the USAFA and its surroundings is included as Figure 2-2. Although several types of small aircraft use the USAFA runways (Figure 2-3), the principal operations contributing to noise generation are from the single-engine aircraft stationed at the USAFA, which are used for training. Aardvark and Bullseye auxiliary airfields are used by the pilots for proficiency training. Until late 1997, the T-3A Firefly was the primary aircraft at the USAFA. Now the majority of the training operations are flown in a single-engine T-41C aircraft, derived from the Cessna R172E. The T-3A is no longer flown at the USAFA, however its operation specifications were included in this analysis in order to model potential operation impacts for the Introductory Flight Training (IFT) Program. There is a minor difference in the noise signature of the Cessna and the T-3A aircraft; the T-3A is slightly louder.

Departures of tow planes are generally made from Runway 16R to mitigate noise disturbance to the neighboring communities. These aircraft are supplied with only the amount of fuel necessary to complete the mission with a small reserve for safety. This practice results in less weight in the aircraft, allowing increased climb rates and reduced power takeoffs, which reduce the noise levels to the surrounding environs. Other aircraft are routed away from noise-sensitive areas to minimize public disturbance.

USAFA is encompassed by Class D airspace up to 2,500 feet above MSL. It is surrounded by an Alert Area (A-260). A total of 309,052 annual airfield operations were assessed for USAFA in 2003. Diamond DV20-C1 Falcon aircraft accounted for 149,760 of the 309,052 airfield operations. Table 2-8 summarizes the airfield operations at USAFA.

Approximately 5,200 annual Diamond DA20-C1 Falcon airfield operations were assessed for Bullseye Auxiliary Airfield in 2003. Table 2-9 provides existing daily and yearly airfield operations based on 260 days of operation per year.

¹ Personal communication, Tim Davis, Colorado Springs FAA ATC Tower, September 2003

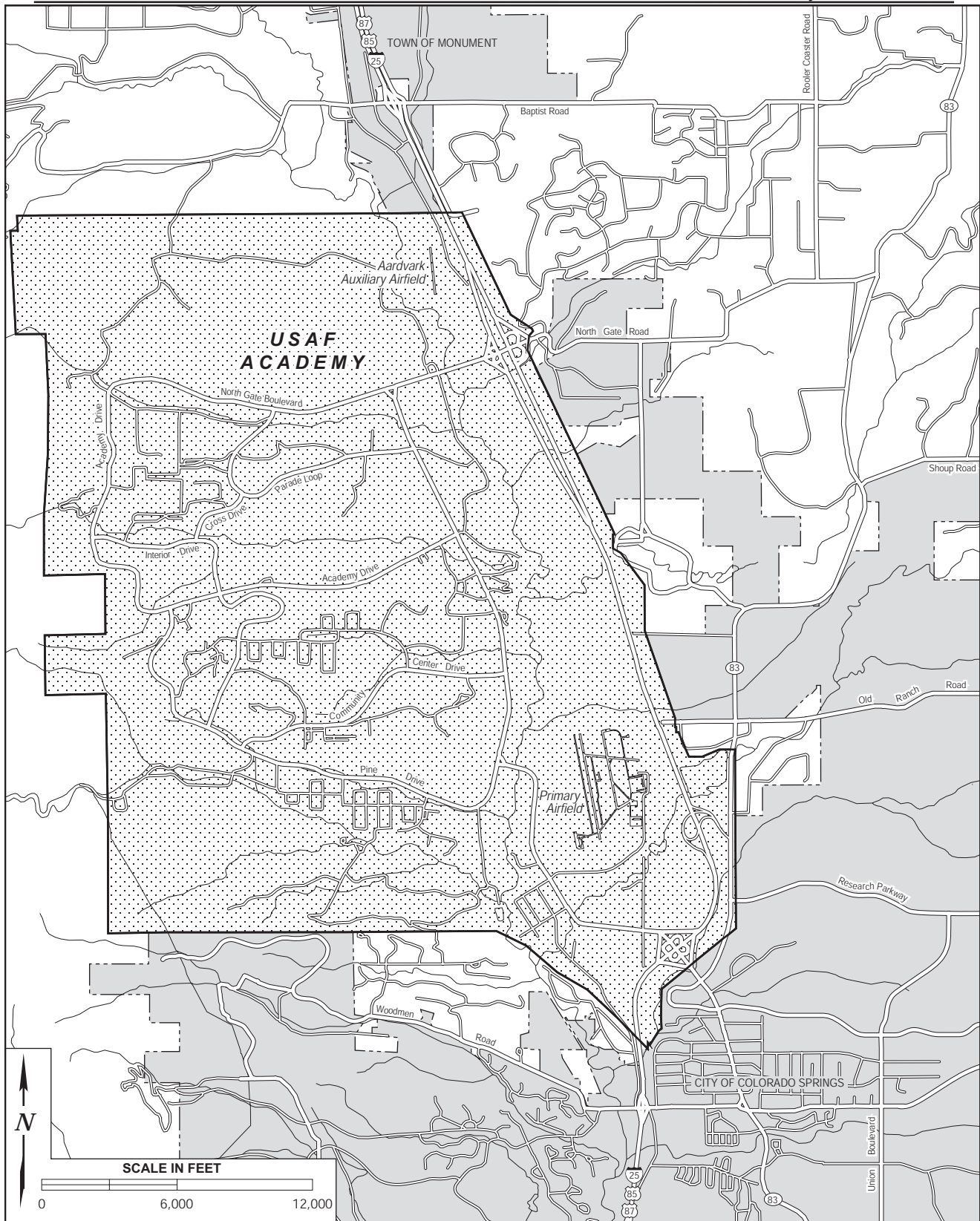


Figure 2-2. Vicinity Map USAFA, Colorado Springs, Colorado

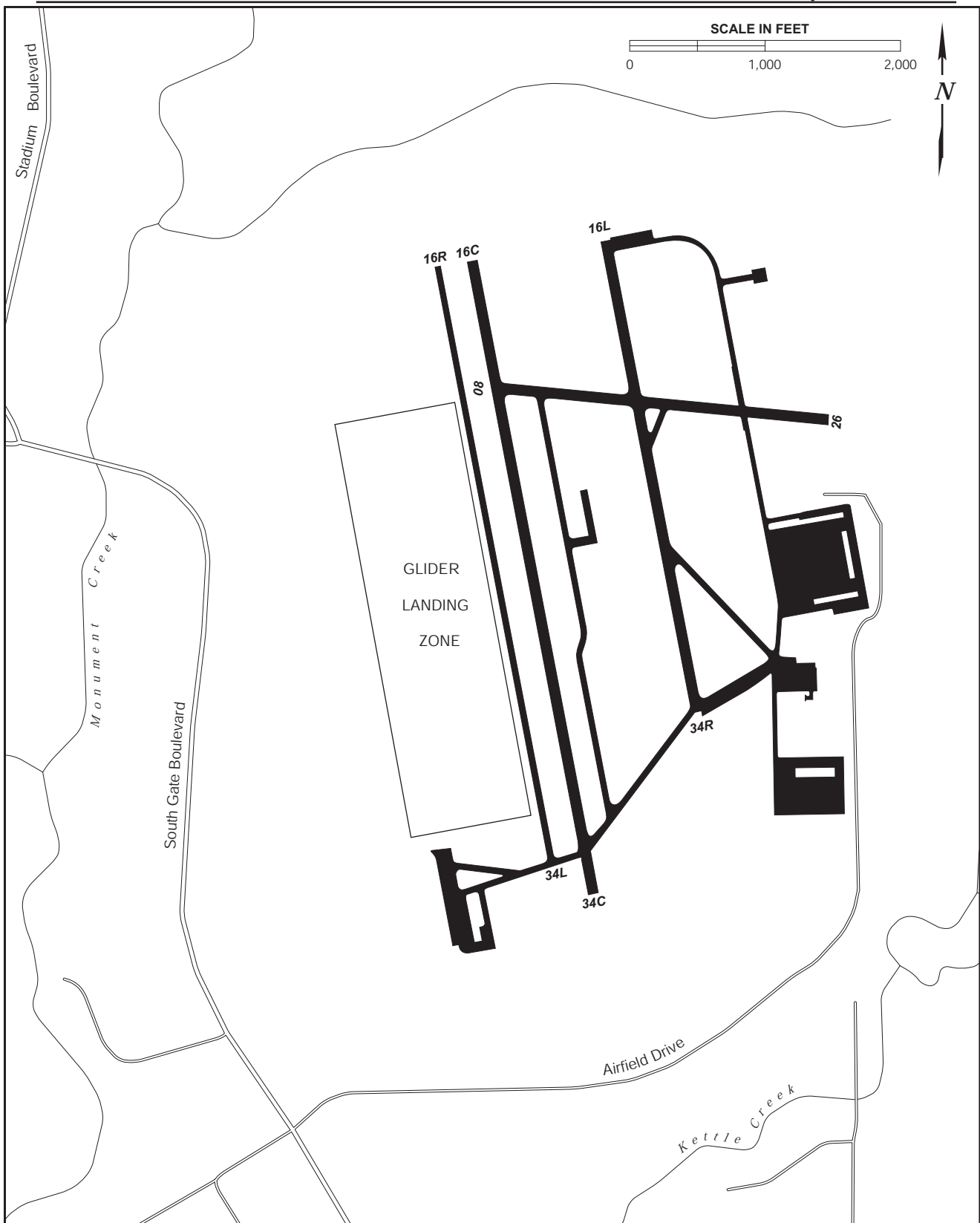


Figure 2-3. USAFA Main Airfield

Table 2-9. Summary of Airfield Operations at Bullseye Auxiliary Airfield

Aircraft	Number of Daily Operations			Annual Total
	Day	Night	Total	
Primary IFT Trainer (Diamond DV20-C1 Falcon)				
Total T-3 (Firefly) Arrival	10.00	0.00	10.00	
Total T-3 (Firefly) Departure	10.00	0.00	10.00	
Total T-3 (Firefly) Closed Pattern	0.00	0.00	0.00	5,200
Bullseye Auxiliary Airfield Operations				
Flying Days Per Year				260
Total Annual Airfield Operations in 1997				5,200

Airfield planning considers three primary aircraft operational/land use determinants: (1) accident potential to land users, (2) aircraft noise and (3) hazards to operations from land uses (e.g., height obstructions). Each of these concerns is addressed in conjunction with mission requirements and safe aircraft operations to determine the optimum flight track for each aircraft type: flight tracks depicted in Figures 2-4, 2-5, and 2-6 are the result of such planning for the USAFA Airfield and Aardvark Auxiliary Airfield. Departures are shown in Figure 2-4, arrivals in Figure 2-5, and closed patterns in Figure 2-6. Departures are noisier than arrivals because of the need for more power on take-offs. Closed patterns at the USAFA are used primarily for practice take-offs and landings by student pilots. These flight tracks have been configured to implement practicable mitigation measures to reduce noise impacts to the local community while maintaining flight safety standards. Bullseye Auxiliary Airfield was also used for practice take-offs and landings by student pilots and may be used in the future by the IFT Program.

Figure 2-7, 2-8, and 2-9 depicts the departure, arrival, and closed pattern tracks associated with Bullseye Auxiliary Airfield. Flight track configurations result from the following considerations:

- Takeoff patterns routed to avoid heavily populated areas when possible
- USAF criteria governing speed, rate of climb, and turning radius for aircraft that use the installation
- Efforts to control and schedule missions to keep noise levels low
- Coordination with the FAA to minimize conflict with civilian aircraft operations from the installations main and auxiliary airfields

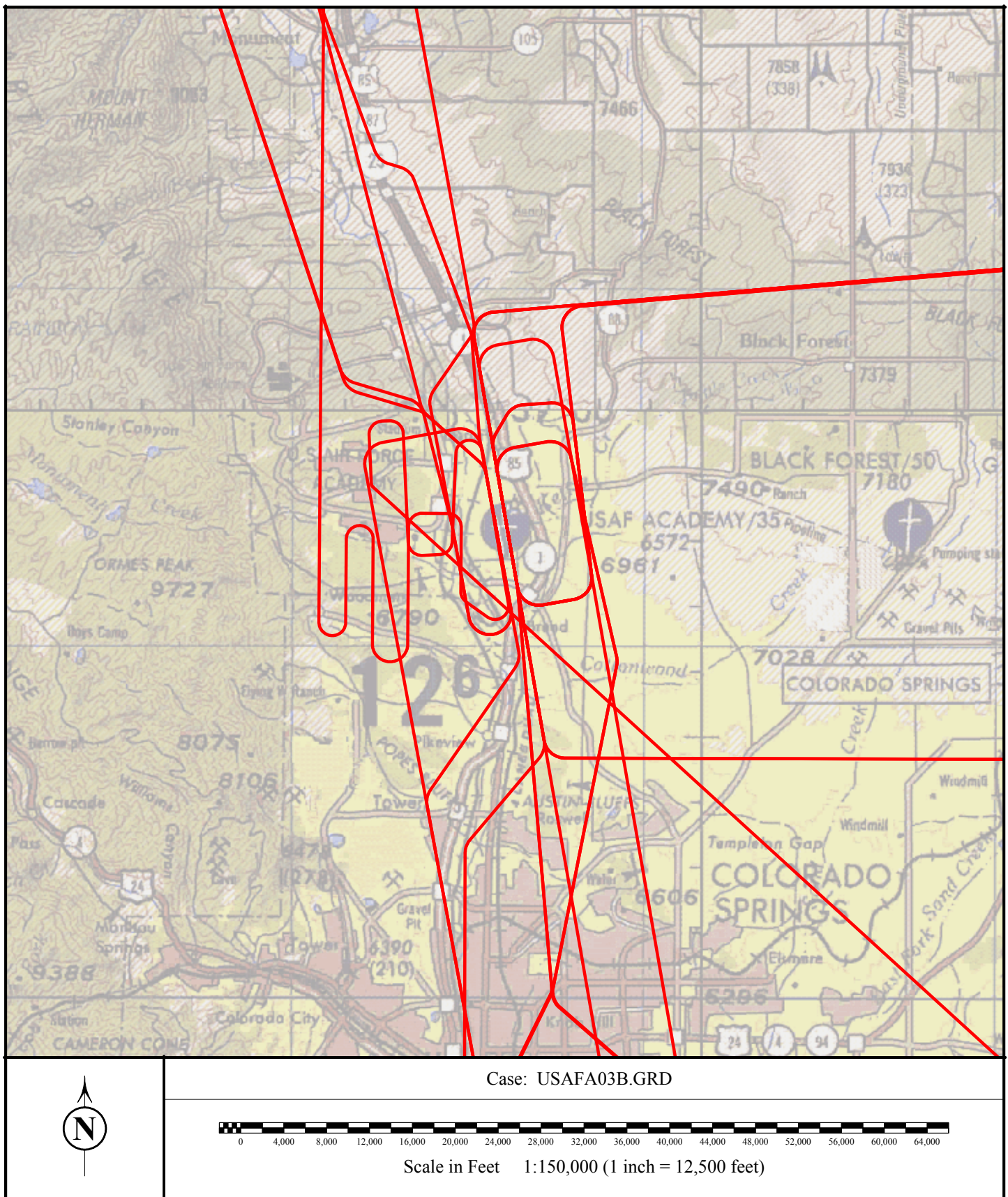


Figure 2-4. USAFA Flight Tracks: Departures

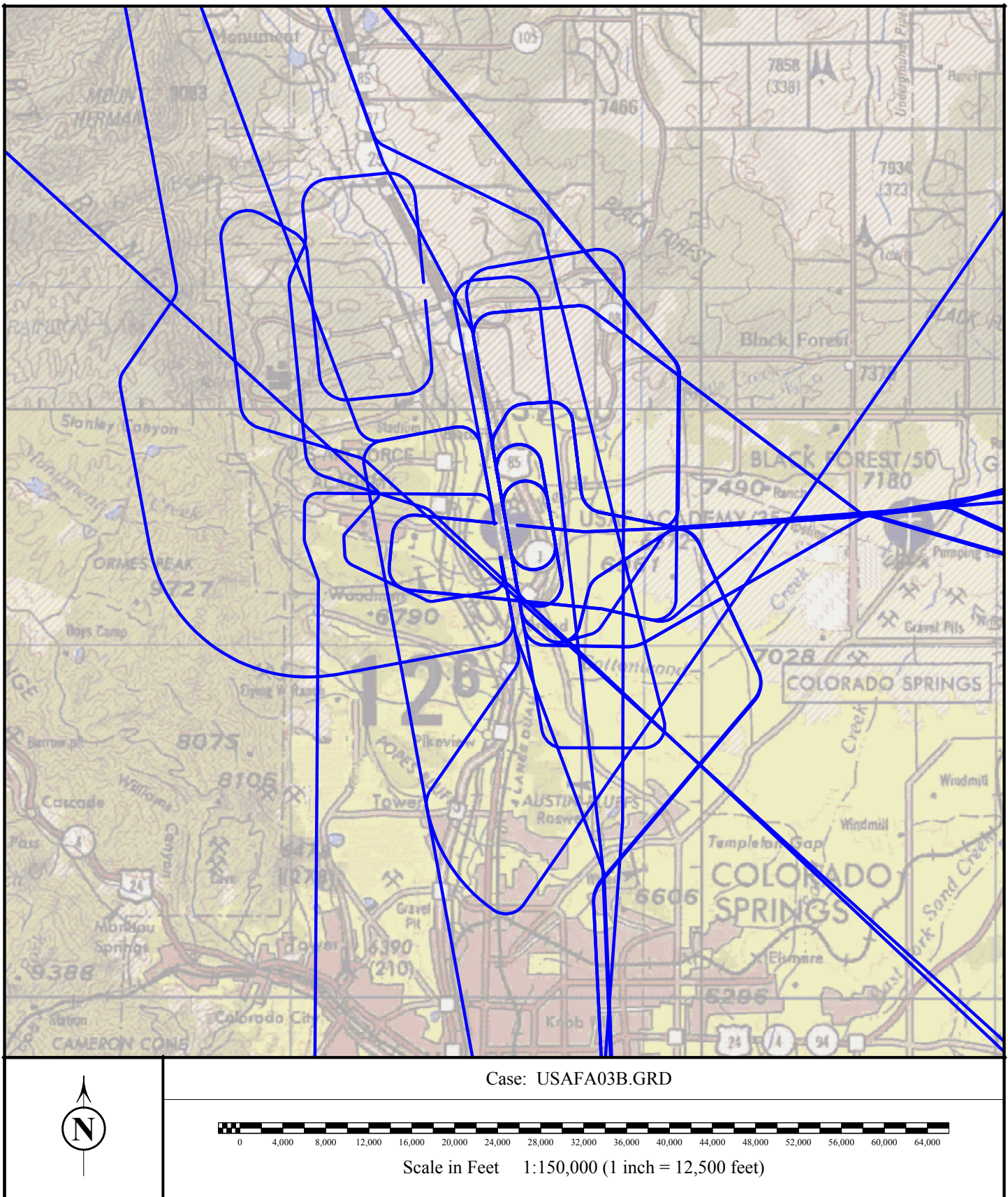


Figure 2-5. USAFA Flight Tracks: Arrivals

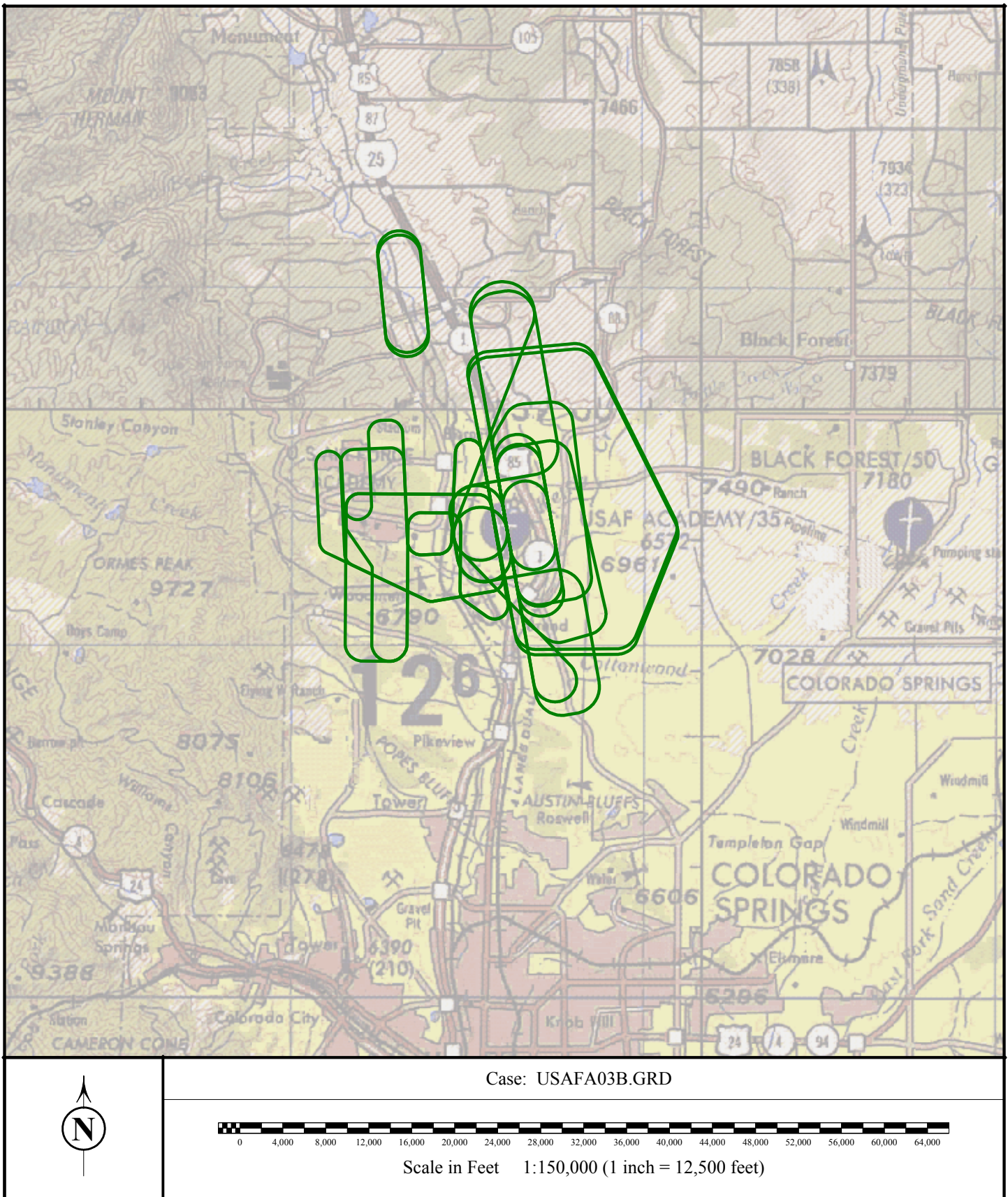


Figure 2-6. USAFA Flight Tracks: Closed Patterns

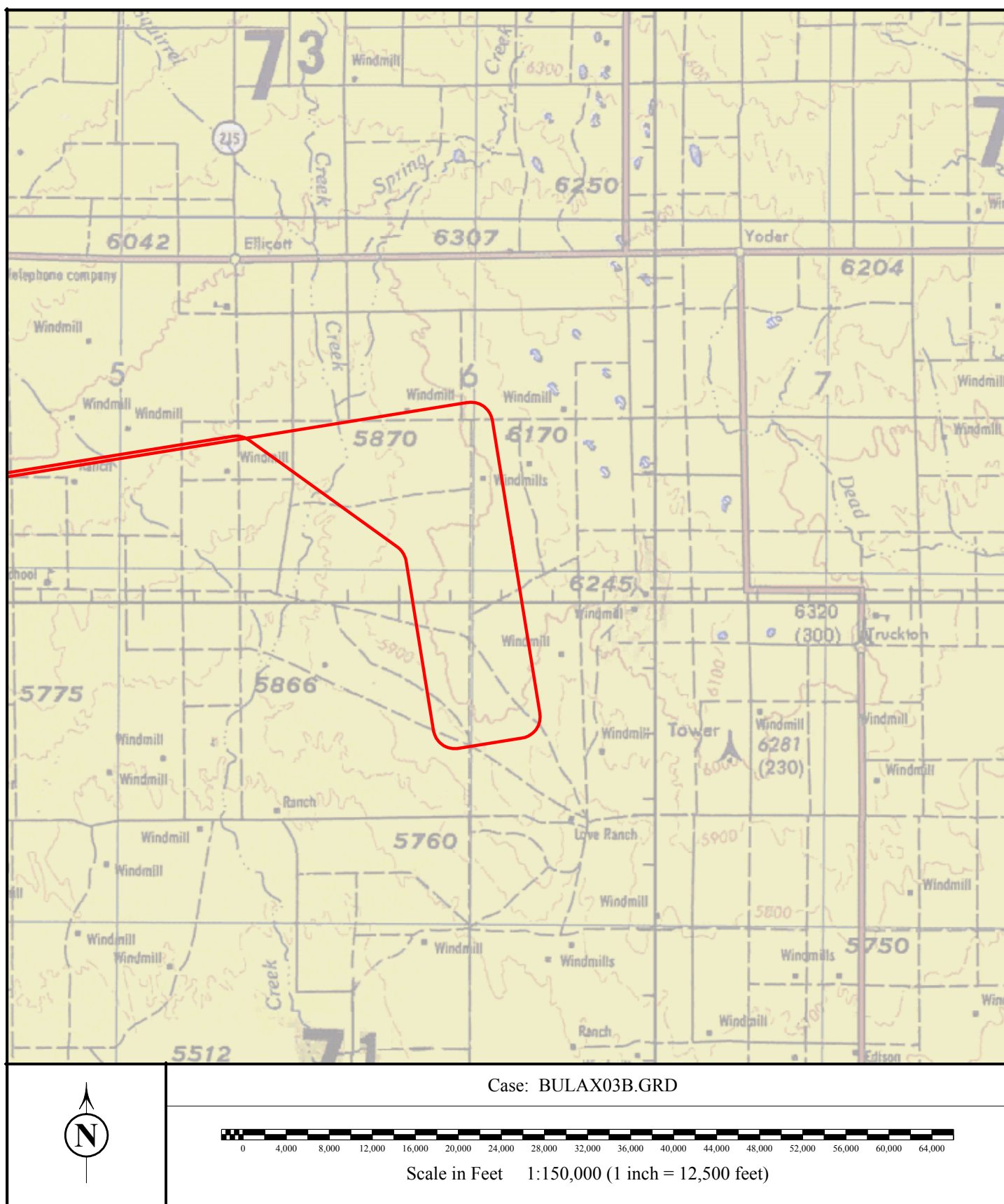


Figure 2-7. Bullseye Auxiliary Airfield Flight Tracks: Departures

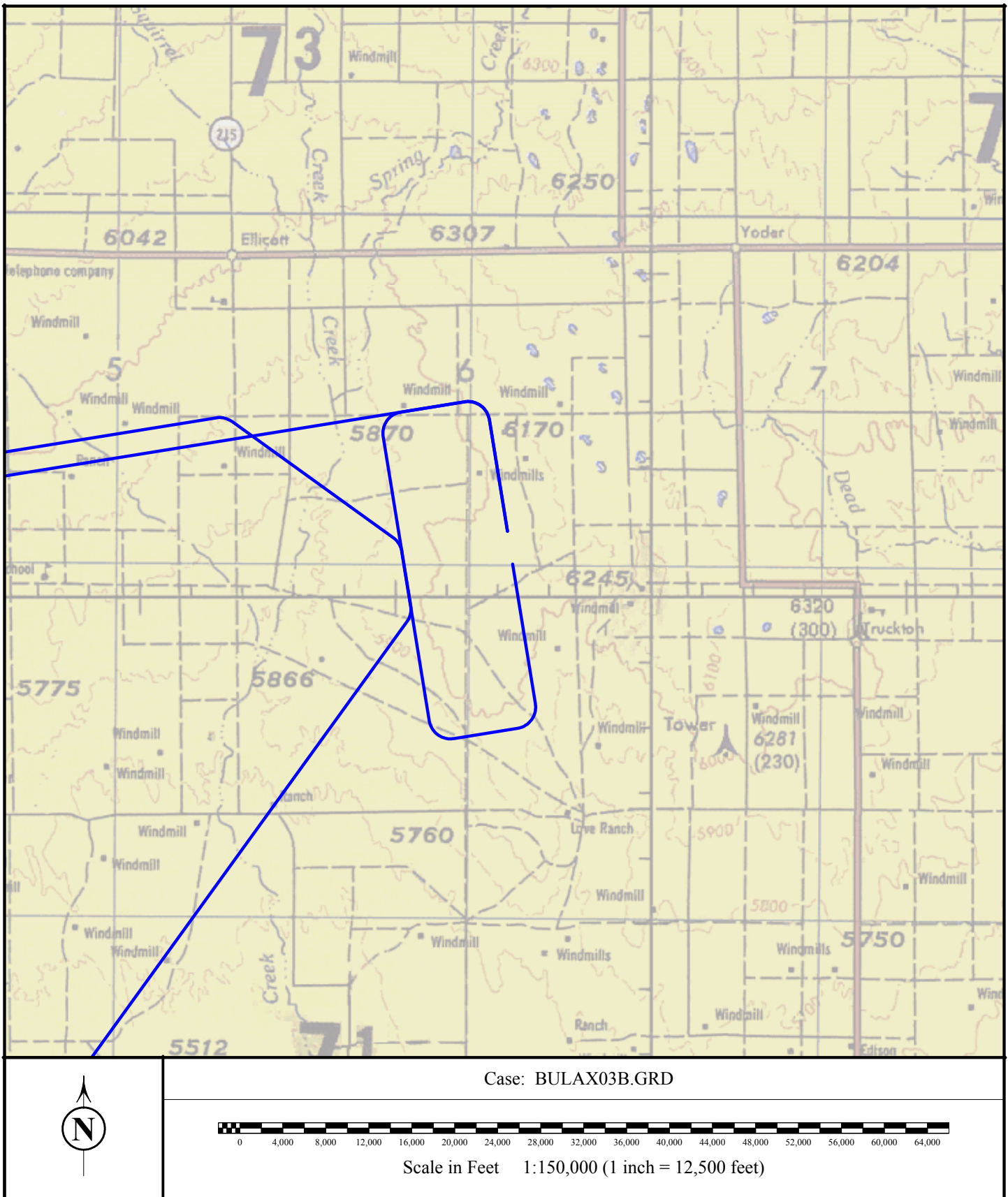


Figure 2-8. Bullseye Auxiliary Airfield Flight Tracks: Arrivals

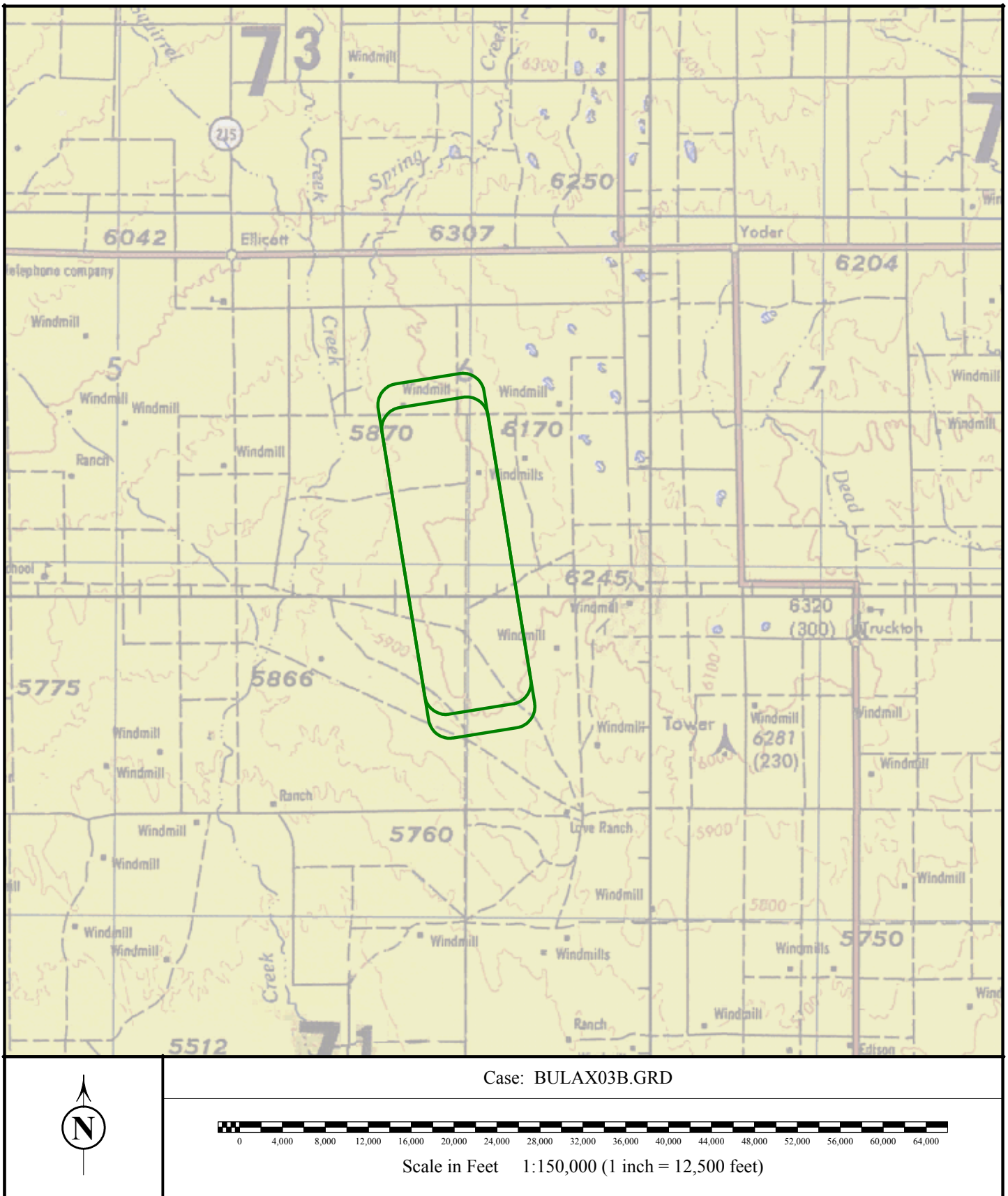


Figure 2-9. Bullseye Auxiliary Airfield Flight Tracks: Closed Patterns

USAFA airfield does not have lighted runways because it does not support nighttime operations; therefore, there is no noise disturbance after sunset. Daily operations are coordinated with the FAA and flight paths are integrated to minimize conflict with civilian aircraft operations at the Colorado Springs Airport and other private, commercial, and government flying activities. Efforts are continually expended to control and schedule flying to keep noise levels to an absolute minimum. Flight corridors have been selected to try and minimize community disturbances.

2.4.2 Flyover Operations

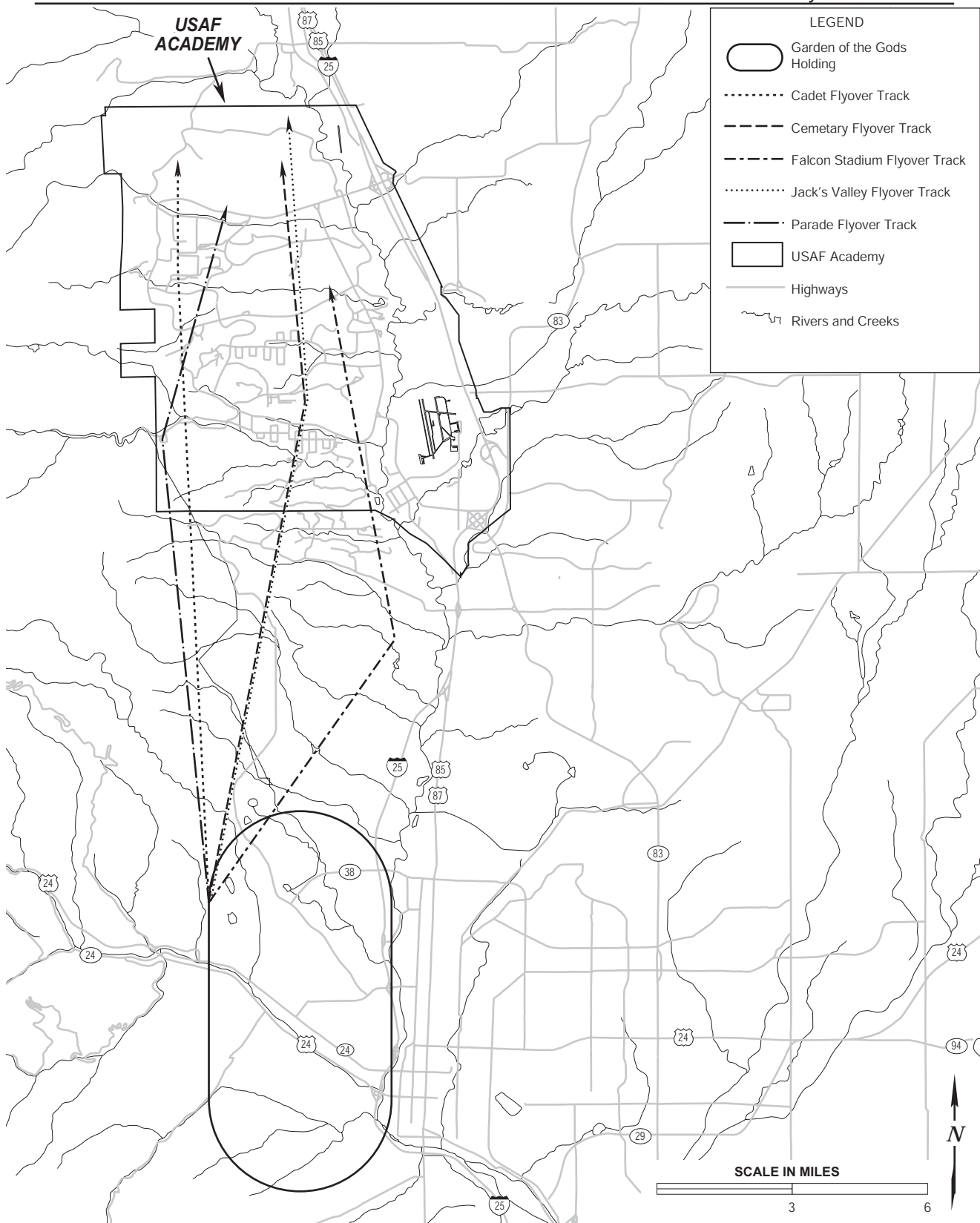
The USAFA conduct flyovers and other aerial activities throughout the year to support cadet and USAFA programs and events. Some of the annual events include graduation, funerals, and home football games.

The USAFA in conjunction with the Colorado Springs Approach Control Tower have designated two holding areas for aircraft participating in flyovers. One is in the area of Garden of the Gods and the other just south of the City of Colorado Springs in a restricted airspace area designated R-2601. Five ground tracks have been designated for use during flyover events: Cadet Area, Falcon Stadium, Parade, Cemetery, and Jack's Valley flyover Tracks. The flyover tracks are shown in Figure 2-10.

Since the USAFA flyovers are infrequent in nature and the types of aircraft conducting the flyovers can be any aircraft in the Department of Defense inventory, these operations were not included in the noise analysis of this AICUZ.

2.5 Air Traffic Control

The safe, orderly, and compatible use of the nation's airspace is made possible through a system of flight rules and regulations, airspace management actions, and ATC procedures just as use of the nation's highway system is governed by traffic laws and rules for operating vehicles. The national airspace system is designed and managed to protect aircraft operations around most airports and along the network of air traffic routes interconnecting these airports, as well as within special areas where activities, such as military flight training, are conducted. The FAA has the overall responsibility for managing the airspace system and accomplishes this through close coordination with state aviation and airport planners, military airspace managers, and other entities to determine how airspace can be used most effectively to serve all interests.



The airfield and air traffic at the USAFA operate under Visual Flight Rules (VFR). Most procedures governing aircraft operations and airspace use distinguish between two types of flight rules - visual and instrument, which dictate how and where a pilot can operate. Pilot qualifications, certifications, and the type of aviation generally dictate which rules must be used. For instance, general aviation pilots who possess only a private license and fly light aircraft normally operate under VFR. These rules do not require ATC clearances and generally allow pilots to fly unrestricted under 18,000 feet MSL using visual references such as towns, highways, and railroads as a means of navigation. VFR relies on “see-and-avoid” flights which require pilots to be visually alert for and to maintain safe distances from other obstacles (e.g., other aircraft, radio towers).

2.6 Controlled Airspace

The USAFA and its auxiliary airfields are located in a high-volume air traffic area. Denver International Airport is located approximately 80 miles northeast, Colorado Springs Municipal Airport is 15 miles southeast of the installation, and the Pueblo Airport is 45 miles south of the installation. All of these airports have sufficient air traffic volumes to warrant control by airfield ATC towers. Federal Aviation Regulations (FARs) ensure that the nation’s busiest airports are surrounded by controlled airspace. Controlled airspace is a generic term that covers the different classifications of airspace (described below) and defined dimensions within which air traffic control service is provided to Instrument Flight Rules (IFR) flights and to VFR flights in accordance with the airspace classification (Figure 2-11).

Class A Airspace. Generally, that airspace from 18,000 feet MSL up to and including flight level 600 (60,000 feet MSL), including the airspace overlying the waters within 12 NMs off the coast of the 48 contiguous United States and Alaska; and designated international airspace beyond 12 nautical miles of the coast of the 48 contiguous States and Alaska within areas of domestic radio navigational signal or ATC radar coverage, and within which domestic procedures are applied.

Class B Airspace. Generally, Class B airspace encompasses the airspace from the runway surface to 10,000 feet MSL surrounding the nation’s busiest airports in terms of IFR operations or passenger enplanements. The configuration of each Class B airspace area is individually tailored and consists of a surface area and two or more layers (some Class B airspace areas resemble upside-down wedding cakes), and is designed to contain all published instrument procedures once an aircraft enters the airspace. An ATC clearance is required for all aircraft to operate in the area, and all aircraft that are so cleared receive separation services within the airspace. The cloud clearance requirement for VFR operations is “clear of clouds.”

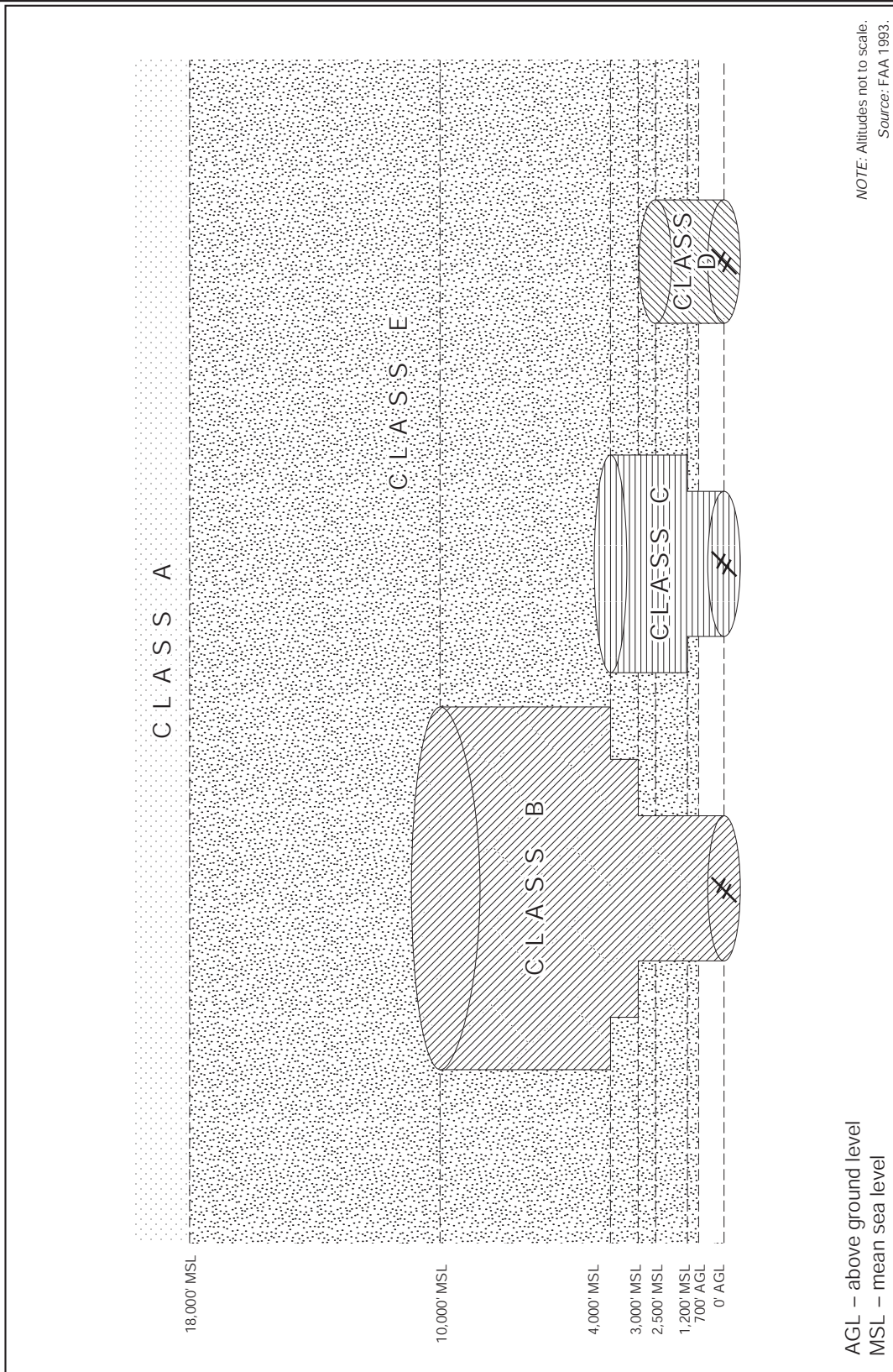


Figure 2-11. FAA Controlled Airspace Classifications

Class C Airspace. Generally, that airspace from the surface to 4,000 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower, are serviced by a radar approach control, and that have a certain number of IFR operations or passenger enplanements. Although the configuration of each Class C airspace area is individually tailored, the airspace usually consists of a 5 NM radius core surface area that extends from the surface up to 4,000 feet above the airport elevation, and a 10 NM radius shelf area that extends from 1,200 feet to 4,000 feet above the airport elevation.

Class D Airspace. Generally, that airspace from the surface to 2,500 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower. The configuration of each Class D airspace area is individually tailored and when instrument procedures are published, the airspace will normally be designed to contain the procedures.

Class E Airspace. Generally, if the airspace is controlled but not Class A, B, C, or D, it is Class E airspace. Class E airspace includes designated federal airways, portions of the jet route system, and area low routes. Federal airways have a width of 4 statute miles on either side of the airway centerline and occur between 700 feet above-ground level and 18,000 feet MSL but may have a floor located at ground level at non-towered airfields. These airways frequently intersect approach and departure paths of both military and civilian airfields.

Local Airspace. The USAFA has its own ATC personnel to provide flight tracking and aircraft separation services for VFR aircraft in the vicinity of the airfield. In certain situations, aircraft separation requirements may necessitate different routing than the flight tracks shown in Figure 2-13. Bullseye Auxiliary Airfield is located in Class E airspace and USAFA aircraft using this airfield coordinate with Colorado Springs Approach Control for clearance to and from the airfield.

Colorado Springs Approach Control and the USAFA ATC have control of separate areas of different airspace classifications. Figure 2-12 illustrates the Class C airspace associated with Colorado Springs Airport and the smaller Class D airspace controlled by the USAFA. Rules for operations within Class C and D airspace are contained in the FARs. Figure 2-12 also shows airspace surrounding the USAFA designated as Alert Area A-260. This designation was applied to the USAFA because of the large number of aircraft operations that occur daily (an average of over 680 in 2003) at the USAFA's main airfield. This designation warns other pilots that it is a very busy area that should be avoided by non-USAFA-controlled aircraft. The USAFA uses other airspace to the north, northeast and east of

the Academy as practice areas for student pilots. These areas are located primarily within El Paso, Douglas and Elbert counties, with a small area near Centennial Airport that is in Arapahoe County. The routes taken by pilots to access these areas are shown in Figure 2-13 and the areas themselves are shown in Figure 2-14.

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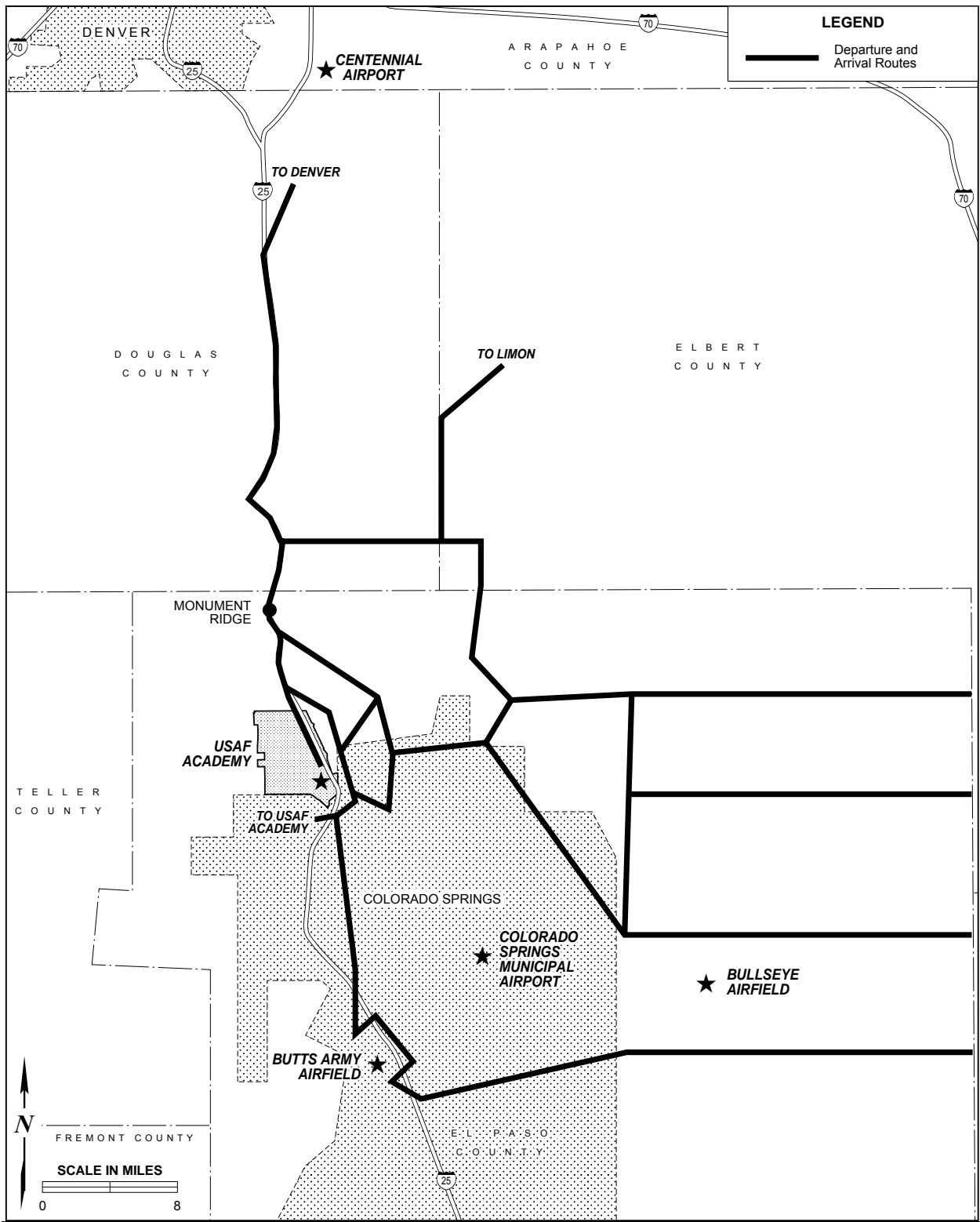


Figure 2-13. Routes to USAFA Practice Areas

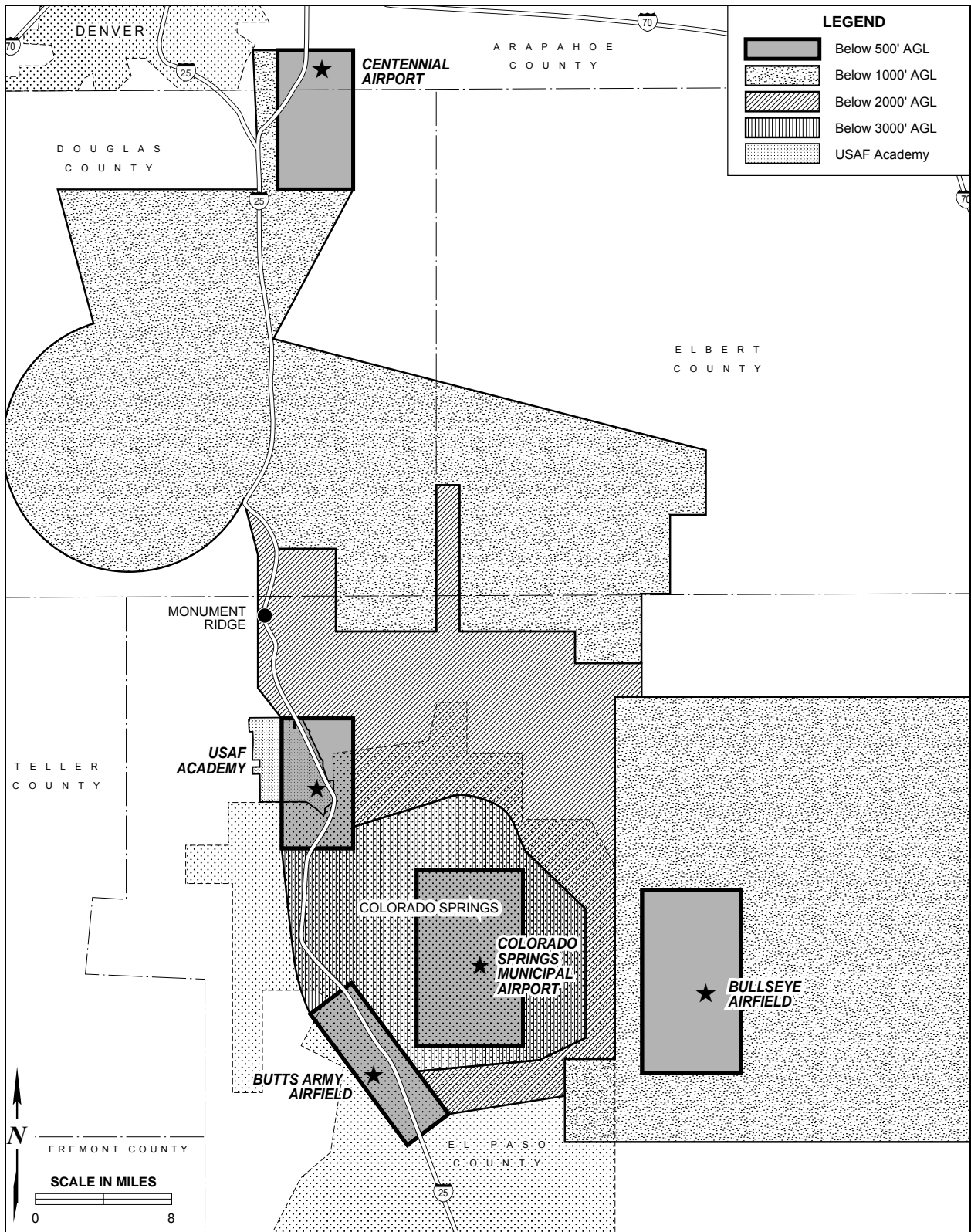


Figure 2-14. USAFA Practice Areas

3. Land Use Compatibility Guidelines

3.1 Introduction

The Department of Defense (DOD) developed the AICUZ program for military airfields in 1973. Using this program, DOD works to protect aircraft operational capabilities at its installations and to assist local government officials in protecting and promoting the public health, safety, and welfare. The primary goal of the AICUZ program is to promote compatible land use development around military airfields by providing information on aircraft noise exposure and accident potential.

This AICUZ report describes three basic types of constraints that affect, or result from, flight operations. The first constraint involves areas which the FAA and DOD have identified for height limitations (see Height and Obstruction Criteria in Appendix D). Air Force obstruction criteria are based upon those contained in Federal Aviation Regulation Part 77 under Subpart C. The height restrictions are to prevent man-made structures from being built in the flight path of aircraft using airports. Aircraft approach and depart from airports on a diagonal line that gets farther from the ground as distance from the airport increases. The height and obstructions criteria reflect that fact, and allow taller structures farther away from the airport.

The second constraint involves noise zones produced by the computerized DNL and DOD NOISEMAP methodologies. The USAF NOISEMAP 6.5 computer program, which is similar to FAA's Integrated Noise Model but contains specific information on military aircraft, produces contours showing the noise levels generated by aircraft operations. The AICUZ report generally contains noise contours plotted in increments of 5 decibels (dB), ranging from 65 to 80 DNL. Figure 3-1 shows noise contours based on current operations at the USAFA, which range from 65 to 70 DNL. This figure also shows that the noise contours do not extend off USAFA property. Additional information on noise methodology is contained in Appendix C of this report.

The third constraint involves APZs based on statistical analysis of past DOD aircraft accidents. DOD analyses have determined that the areas immediately beyond the ends of runways and along the approach and departure flight paths have the highest potential for aircraft accidents. Based on these analyses, the DOD developed three zones which have high relative potential for accidents. The Clear Zone (CZ), the area closest to the runway end, exhibits the highest accident potential. The overall risk is so high that DOD generally acquires the land through purchase or easement to prevent development. APZ I is an area beyond the CZ which possesses a significant potential for accidents.

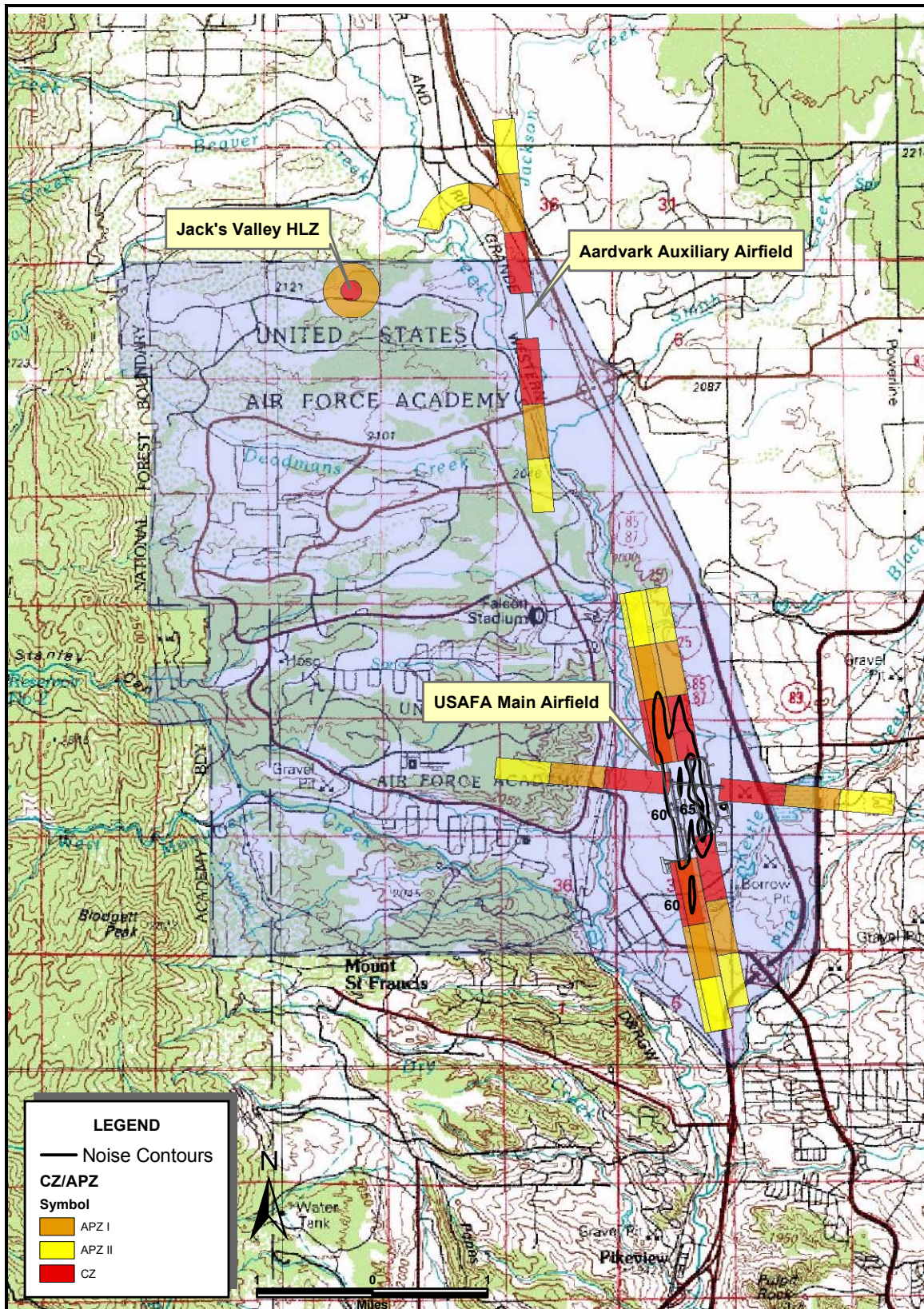


Figure 3-1. USAFA Noise Contours and Accident Potential Zones

APZ II is an area beyond APZ I having measurable potential for accidents. Figure 3-1 illustrates these zones for each of the runways on the USAFA and Figure 3-2 shows these zones for Bullseye Auxiliary Airfield. APZs are shown for the main runways as well as the crosswind runway at the main airfield which is used only for emergencies, and the small runway at the northern corner of the installation which is used to practice low approaches. While aircraft accident potential in APZs I and II does not warrant acquisition by the Air Force, land use planning and controls are strongly encouraged in these areas for the protection of the public. The USAFA CZs encompass areas 1,000 feet wide by 3,000 feet long. APZ I and APZ II are 1,000 feet wide by 2,500 feet long. Additional information on accident potential is contained in Appendix B of this report.

3.2 Land Use Compatibility

Each AICUZ report contains general land use guidelines related to safety and noise associated with aircraft operations. Table 3-1 lists land uses that are compatible or incompatible with various combinations of noise exposure and accident potential. Noise guidelines are essentially the same as those published by the Federal Interagency Committee on Urban Noise in the June 1980 publication, *Guidelines for Considering Noise in Land Use Planning Control*. The *Standard Land Use Coding Manual (SLUCM)* published by the U.S. Department of Transportation, Federal Highway Administration, has been used for identifying and coding land use activities.

3.3 Participation in the Planning Process

As local communities prepare their land use plans, the Air Force must be ready to provide additional inputs. Air Force Instruction 32-7063, *Air Installation Compatible Use Zone Program*, and Air Force Handbook 32-7084, *AICUZ Program Manager's Guide*, give broad AICUZ responsibilities to the Civil Engineer of the Major Command responsible for a base. Responsibility for representation of the installation's interests to local communities is usually delegated to the installation. At the USAFA, the Base Comprehensive Planner has been designated as the official liaison with the local community on all planning matters. This person can be reached at (719) 333-8408. This office is prepared to participate in the continuing discussion of zoning and other land use matters as they may affect, or may be affected by, the USAFA.

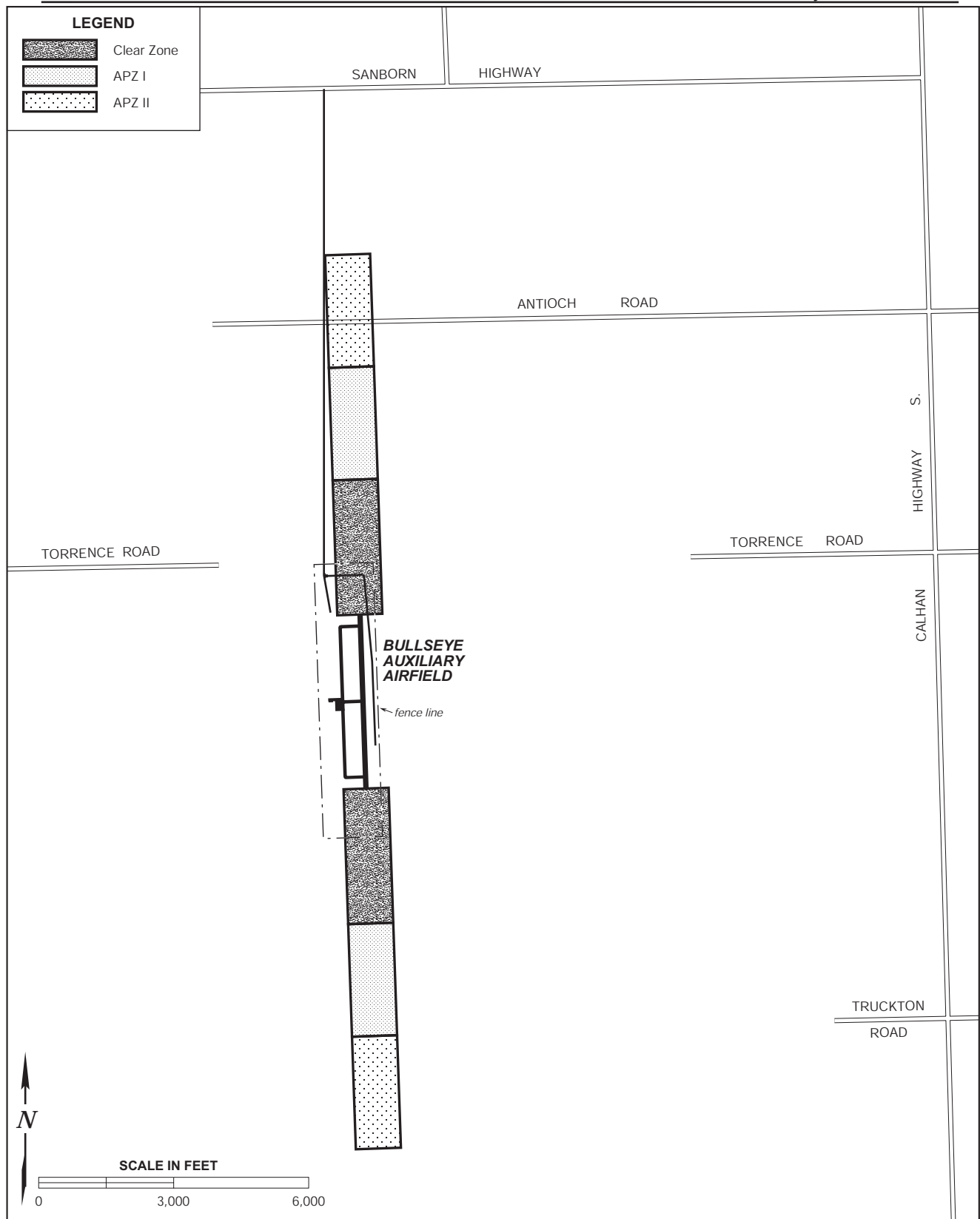


Figure 3-2. Bullseye Auxiliary Airfield Accident Potential Zones

Table 3-1. Land Use Compatibility

Land Use		Accident Potential Zones			Noise Zones			
SLUCM NO.	Name	Clear Zone	APZ I	APZ II	65-69 dB	70-74 dB	75-79 dB	80+ dB
10	Residential							
11	Household units							
11.11	Single units; detached	N	N	Y ¹	A ¹¹	B ¹¹	N	N
11.12	Single units; semi-detached	N	N	N	A ¹¹	B ¹¹	N	N
11.13	Single units; attached row	N	N	N	A ¹¹	B ¹¹	N	N
11.21	Two units; side-by-side	N	N	N	A ¹¹	B ¹¹	N	N
11.22	Two units; one above the other	N	N	N	A ¹¹	B ¹¹	N	N
11.31	Apartments; walk up	N	N	N	A ¹¹	B ¹¹	N	N
11.32	Apartments; elevator	N	N	N	A ¹¹	B ¹¹	N	N
12	Group quarters	N	N	N	A ¹¹	B ¹¹	N	N
13	Residential hotels	N	N	N	A ¹¹	B ¹¹	N	N
14	Mobile home parks or courts	N	N	N	N	N	N	N
15	Transient lodgings	N	N	N	A ¹¹	B ¹¹	C ¹¹	N
16	Other residential	N	N	N ¹	A ¹¹	B ¹¹	N	N
20	Manufacturing							
21	Food & kindred products; manufacturing	N	N ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
22	Textile mill products; manufacturing	N	N ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
23	Apparel and other finished products made from fabrics, leather, and similar materials; manufacturing	N	N	N ²	Y	Y ¹²	Y ¹³	Y ¹⁴
24	Lumber and wood products (except furniture); manufacturing	N	Y ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
25	Furniture and fixtures; manufacturing	N	Y ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
26	Paper & allied products; manufacturing	N	Y ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴

Table 3-1. Land Use Compatibility (continued)

Land Use		Accident Potential Zones			Noise Zones			
SLUCM NO.	Name	Clear Zone	APZ I	APZ II	65-69 dB	70-74 dB	75-79 dB	80+ dB
27	Printing, publishing, and allied industries	N	Y ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
28	Chemicals and allied products; manufacturing	N	N	N ²	Y	Y ¹²	Y ¹³	Y ¹⁴
29	Petroleum refining and related industries	N	N	N	Y	Y ¹²	Y ¹³	Y ¹⁴
30	Manufacturing							
31	Rubber and misc. plastic products, manufacturing	N	N ²	N ²	Y	Y ¹²	Y ¹³	Y ¹⁴
32	Stone, clay and glass products manufacturing	N	N ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
33	Primary metal industries	N	N ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
34	Fabricated metal products; manufacturing	N	N ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
35	Professional, scientific, and controlling instruments; photographic and optical goods; watches and clocks manufacturing	N	N	N ²	Y	A	B	N
39	Miscellaneous manufacturing	N	Y ²	Y ²	Y	Y ¹²	Y ¹³	Y ¹⁴
40	Transportation, communications and utilities							
41	Railroad, rapid rail transit and street railroad transportation	N ³	Y ⁴	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
42	Motor vehicle transportation	N ³	Y	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
43	Aircraft transportation	N ³	Y ⁴	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
44	Marine craft transportation	N ³	Y ⁴	Y	Y	Y ¹²	Y ¹³	Y ¹⁴

Table 3-1. Land Use Compatibility (continued)

Land Use		Accident Potential Zones			Noise Zones			
SLUCM NO.	Name	Clear Zone	APZ I	APZ II	65-69 dB	70-74 dB	75-79 dB	80+ dB
45	Highway & street right-of-way	N ³	Y	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
46	Automobile parking	N ³	Y ⁴	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
47	Communications	N ³	Y ⁴	Y	Y	A ¹⁵	B ¹⁵	N
48	Utilities	N ³	Y ⁴	Y	Y	Y	Y ¹²	Y ¹³
49	Other transportation communications and utilities	N ³	Y ⁴	Y	Y	A ¹⁵	B ¹⁵	N
50	Trade							
51	Wholesale trade	N	Y ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
52	Retail trade – building materials, hardware and farm equipment	N	Y ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
53	Retail trade – general merchandise	N	N ²	Y ²	Y	A	B	N
54	Retail trade-food	N	N ²	Y ²	Y	A	B	N
55	Retail trade – automotive, marine craft, aircraft and accessories	N	Y ²	Y ²	Y	A	B	N
56	Retail trade - apparel and accessories	N	N ²	Y ²	Y	A	B	N
57	Retail trade - furniture, home furnishings and equipment	N	N ²	Y ²	Y	A	B	N
58	Retail trade - eating and drinking establishments	N	N	N ²	Y	A	B	N
59	Other retail trade	N	N ²	Y ²	Y	A	B	N
60	Services							
61	Finance, insurance and real estate services	N	N	Y ⁶	Y	A	B	N
62	Personal services	N	N	Y ⁶	Y	A	B	N
62.4	Cemeteries	N	Y ⁷	Y ⁷	Y	Y ¹²	Y ¹³	Y ^{14,21}
63	Business services	N	Y ⁸	Y ⁸	Y	A	B	N
64	Repair services	N	Y ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
65	Professional services	N	N	Y ⁶	Y	A	B	N
65.1	Hospitals, nursing homes	N	N	N	A*	B*	N	N

Table 3-1. Land Use Compatibility (continued)

Land Use		Accident Potential Zones			Noise Zones			
SLUCM NO.	Name	Clear Zone	APZ I	APZ II	65-69 dB	70-74 dB	75-79 dB	80+ dB
65.1	Other medical facilities	N	N	N	Y	A	B	N
66	Contract construction services	N	Y ⁶	Y	Y	A	B	N
67	Governmental services	N	N	Y ⁶	Y*	A*	B*	N
68	Educational services	N	N	N	A*	B*	N	N
69	Miscellaneous services	N	N ²	Y ²	Y	A	B	N
70	Cultural, entertainment and recreational							
71	Cultural activities (including churches)	N	N	N ²	A*	B*	N	N
71.2	Nature exhibits	N	Y ²	Y	Y*	N	N	N
72	Public assembly	N	N	N	Y	N	N	N
72.1	Auditoriums, concert halls	N	N	N	A	B	N	N
72.11	Outdoor music shell, amphitheaters	N	N	N	N	N	N	N
72.2	Outdoor sports arenas, spectator sports	N	N	N	Y ¹⁷	Y ¹⁷	N	N
73	Amusements	N	N	Y ⁸	Y	Y	N	N
74	Recreational activities (including golf courses, riding stables, water recreation)	N	Y ^{8,9,10}	Y	Y*	A*	B*	N
75	Resorts and group camps	N	N	N	Y*	Y*	N	N
76	Parks	N	Y ⁸	Y ⁸	Y*	Y*	N	N
79	Other cultural, entertainment and recreation	N	Y ⁹	Y ⁹	Y*	Y*	N	N
80	Resources production and extraction							
81	Agriculture (except livestock)	Y ¹⁶	Y	Y	Y ¹⁸	Y ¹⁹	Y ²⁰	Y ^{20,21}
81.5 to 81.7	Livestock farming and animal breeding	N	Y	Y	Y ¹⁸	Y ¹⁹	Y ²⁰	Y ^{20,21}
82	Agricultural related activities	N	Y ⁵	Y	Y ¹⁸	Y ¹⁹	N	N
83	Forestry activities and related services	N ⁵	Y	Y	Y ¹⁸	Y ¹⁹	Y ²⁰	Y ^{20,21}

Table 3-1. Land Use Compatibility (continued)

Land Use		Accident Potential Zones			Noise Zones			
SLUCM NO.	Name	Clear Zone	APZ I	APZ II	65-69 dB	70-74 dB	75-79 dB	80+ dB
84	Fishing activities and related services	N ⁵	Y	Y	Y	Y	Y	Y
85	Mining activities and related services	N	Y ⁵	Y	Y	Y	Y	Y
89	Other resources production and extraction	N	Y ⁵	Y	Y	Y	Y	Y

Legend:

SLUCM - Standard Land Use Coding Manual, U.S. Department of Transportation.

Y - (Yes) - Land uses and related structures are compatible without restriction.

N - (No) - Land use and related structures are not compatible and should be prohibited.

Y^X - (Yes with Restrictions) - Land use and related structures generally compatible; see notes indicated by the superscript.

N^X - (No with Exceptions) - See notes indicated by the superscript.

NLR - Noise Level Reduction (NLR) - (outdoor to indoor) to be achieved through incorporation of noise attenuation measures into the design and construction of the structures.

A, B, or C - Land use and related structures generally compatible; measures to achieve NLR for A (DNL / 65-69), B (DNL / 70-74), C (DNL / 75-79), need to be incorporated into the design and construction of structures.

A^{*}, B^{*}, or C^{*} - Land use generally compatible with NLR. However, measures to achieve an overall noise level reduction do not necessarily solve noise difficulties and additional evaluation is warranted. See appropriate footnotes.

* - The designation of these uses as "compatible" in this zone reflects individual federal agency and program considerations of general cost and feasibility factors, as well as past community experiences and program objectives. Localities, when evaluating the application of these guidelines to specific situations, may have different concerns or goals to consider.

Notes:

1. Suggested maximum density of 1-2 dwelling units per acre, possibly increased under a Planned Unit Development where maximum lot coverage is less than 20 percent.
2. Within each land use category, uses exist where further deliberating by local authorities may be needed due to the variation of densities in people and structures. Shopping malls and shopping centers are considered incompatible use in any accident potential zone (CZ, APZ I, or APZ II).
3. The placement of structures, buildings, or aboveground utility lines in the CZ is subject to severe restrictions. In a majority of the CZs, these items are prohibited. See Air Force Instruction 32-7060 and Air Force Joint Manual 32-8008 for specific guidance.
4. No passenger terminals and no major aboveground transmission lines in APZ I.
5. Factors to be considered: labor intensity, structural coverage, explosive characteristics, and air pollution.
6. Low-intensity office uses only. Meeting places, auditoriums, etc. are not recommended.
7. Excludes chapels.
8. Facilities must be low intensity.
9. Clubhouse not recommended.
10. Areas for gatherings of people are not recommended.
- 11a. Although local conditions may require residential use, it is discouraged in DNL 65-69, and strongly discouraged in DNL 70-74. An evaluation should be conducted prior to approvals, indicating that a demonstrating community need for residential use would not be met if development were prohibited in these zones, and that there are no viable alternative locations.
- 11b. Where the community determines that residential uses must be allowed, measures to achieve outdoor to indoor NLR for DNL 65-69 and DNL 70-74 should be incorporated into building codes and considered in individual approvals.
- 11c. NLR criteria will not eliminate outdoor noise problems. However, building location and site planning, and design and use of berms and barriers can help mitigate outdoor exposure, particularly from near - ground level sources. Measures that reduce outdoor noise should be used whenever practical in preference to measures which only protect interior spaces.
12. Measures to achieve the same NLR as required for facilities in the DNL 65-69 range must be incorporated into the portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.
13. Measures to achieve the same NLR as required for facilities in the DNL 70-74 range must be incorporated into the portions of these buildings where the public is received, office areas, noise sensitive areas or, where the normal noise level is low.
14. Measures to achieve the same NLR as required for facilities in the DNL 75-79 range must be incorporated into the portions of these buildings where the public is received, office areas, noise sensitive areas or, where the normal noise level is low.
15. If noise sensitive, use indicated NLR; if not, the use is compatible.
16. No buildings.
17. Land use is compatible provided special sound reinforcement systems are installed.
18. Residential buildings require the same NLR as required for facilities in the DNL 65-69 range.
19. Residential buildings require the same NLR as required for facilities in the DNL 70-74 range.
20. Residential buildings are not permitted.
21. Land use is not recommended. If the community decides the use is necessary, personnel should wear hearing protection devices.

4. Land Use Analysis

4.1 Introduction

Land use planning and control is a dynamic process. The specific characteristics of land use determinants will always reflect, to some degree, the changing conditions of the economic, social, and physical environment of a community, as well as changing public concern. The planning process accommodates this fluidity, in that many decisions are not based on boundary lines, but rather on more generalized area designations.

USAFA, though originally built in an outlying, largely rural area, is now being encroached upon by suburban, commercial, and industrial development from the north, south, and east. Computer technology has enabled the USAFA to more precisely display its flight tracks and noise contours for land use planning purposes. This same technology has revealed the extent of the USAFA's region of influence which extends from unincorporated areas of El Paso County to the City of Colorado Springs and the Town of Monument.

4.2 Existing Land Use

Existing generalized land use for the areas adjacent to the airfields on the USAFA and Bullseye Auxiliary Airfield are shown in Figure 4-1 and 4-2, respectively. El Paso County, the City of Colorado Springs and the Town of Monument have existing land use plans recognizing the USAFA environs. Currently, the Planning Departments for the City of Colorado Springs and El Paso County coordinate with representatives from the USAFA during the subdivision review process to promote land use compatibility. The USAFA fully supports these activities and is prepared to participate in land use planning and control processes.

AICUZ Study boundaries and noise contours describe the impact of a specific operational environment, and as such, will change if a significant operational change is made. If the local communities that border the USAFA attempt to use the AICUZ boundaries in this study as precise boundary lines for zoning districts, it is conceivable that problems will result. Should a new mission be established at the USAFA adding a larger number of airplanes, or additional model types, the AICUZ could be amended. However, since the noise zones shown in Figure 3-1 do not extend off of the USAFA property, no off base property or populations are affected by the 65 day- night average A-weighted sound level or higher zones. In addition, since the USAFA training program does not require loud jet aircraft, the noise contours would probably never extend off the base even if the number of operations per year were to increase dramatically.

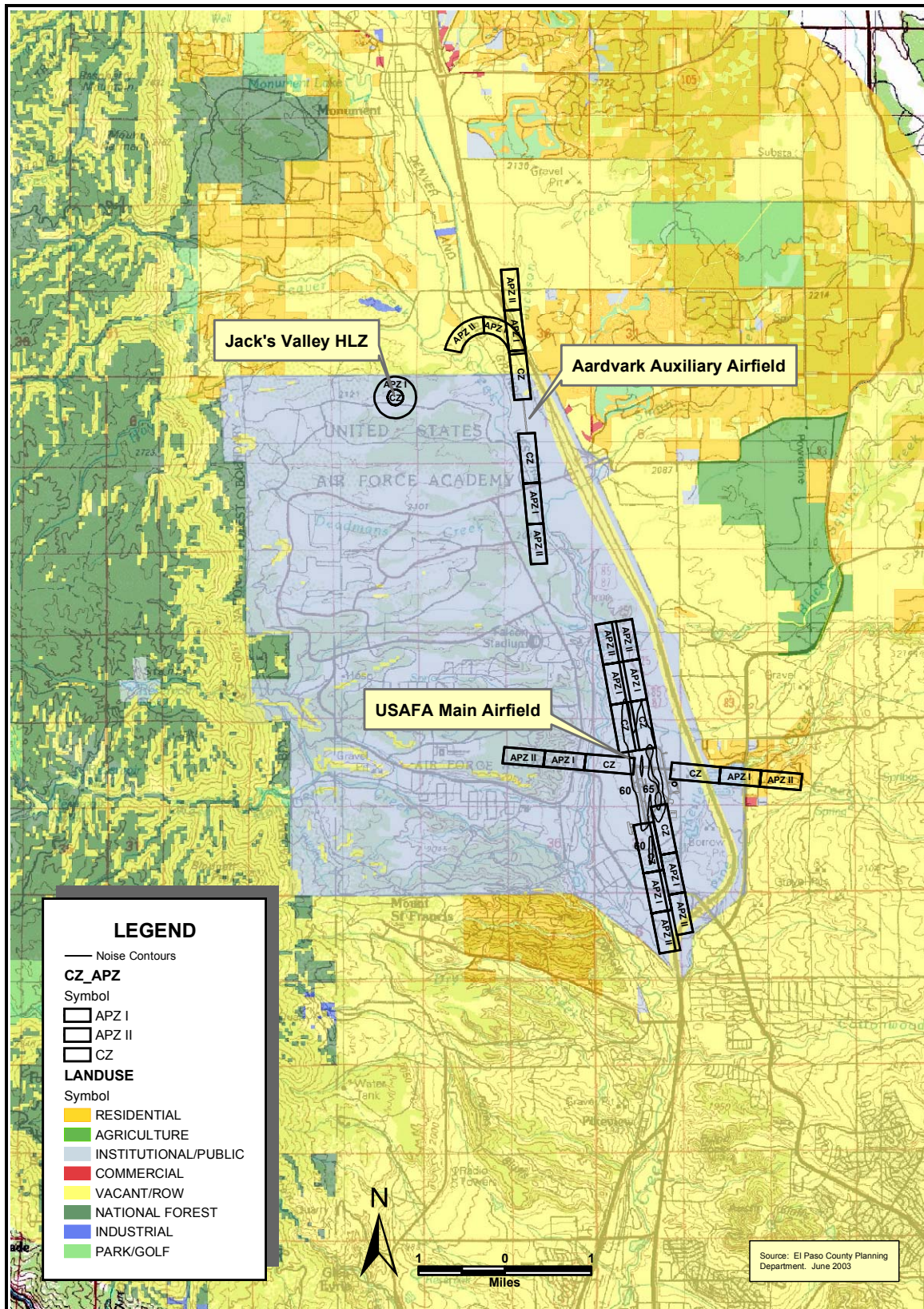


Figure 4-1. Generalized Existing Land Use in the Vicinity of the USAFA

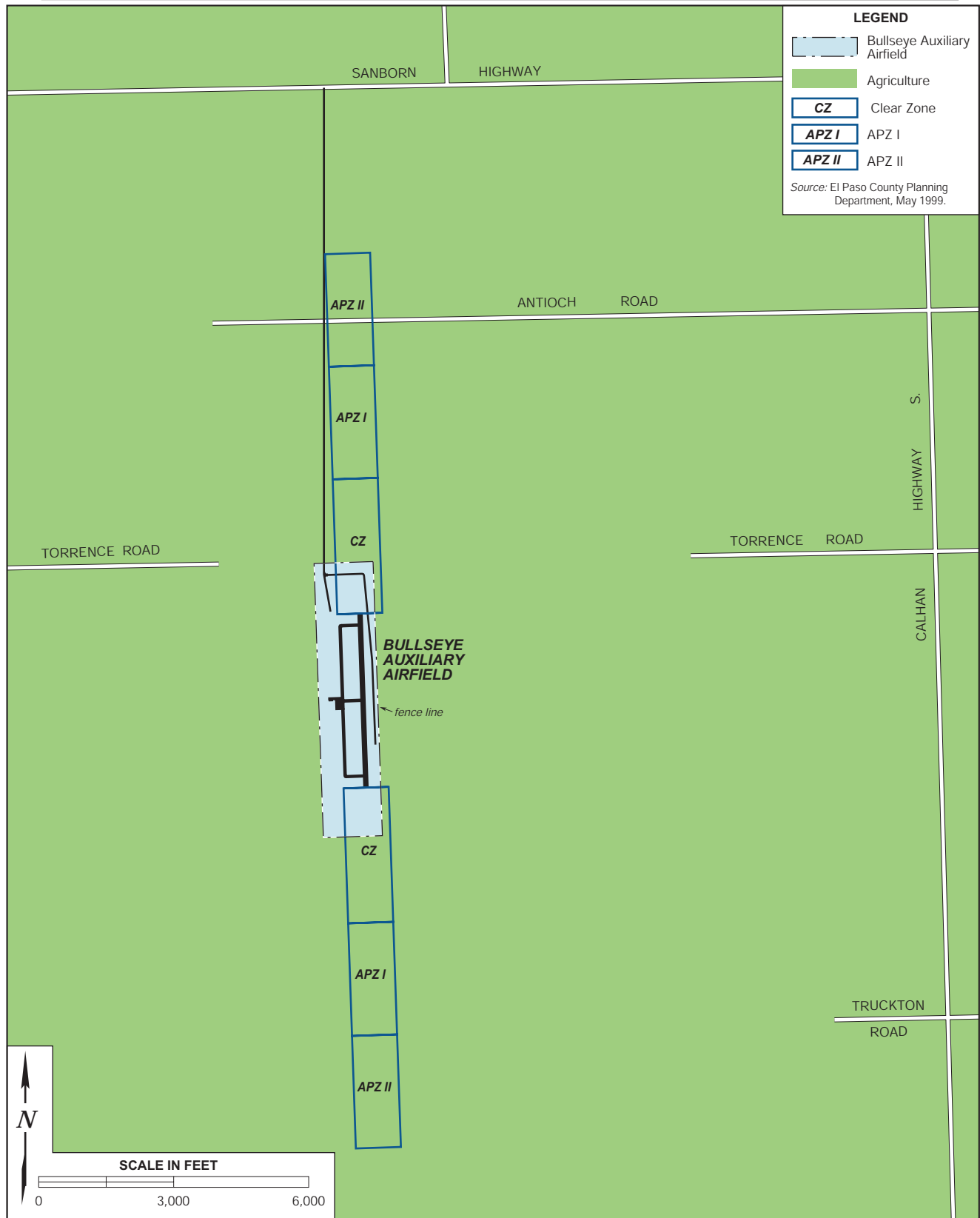


Figure 4-2. Generalized Existing Land Use in the Vicinity of the Bullseye Auxiliary Airfield

The main land use concern is the potential for certain areas in the vicinity of the USAFA to experience a high volume of over-flights, especially in the safety zones (CZs and APZs) and the areas under the flight tracks shown in Figures 2-4 through 2-7. The USAFA has recommended that the City of Colorado Springs, El Paso County, and the Town of Monument planning departments develop a means of notifying land owners in certain areas near the USAFA that they live in areas that may experience numerous overflights. In addition, the USAFA recommends that the planning departments adopt the land use guidelines detailed in Section 3.

Additionally, the USAF is recommending that AICUZ data be utilized with all other planning data. Therefore, specific land use control decisions should not be based solely on AICUZ boundaries. With this in mind, the USAFA provides flight track and noise contour maps in this report that reflect the most current and accurate picture of aircraft activities.

At Bullseye Auxiliary Airfield, the majority of the CZs and all of APZs I and II to the north and south of the airfield lie off USAFA property. Currently, the area is undeveloped and is comprised of agriculture lands with associated farm homes. None of these homes are within the CZ.

4.3 Incompatible Land Use

Figure 4-3 and 4-4 shows the incompatible and potentially incompatible land uses in the vicinity of the USAFA Main Airfield, Aardvark Auxiliary Airfield and Bullseye Auxiliary Airfield. Since the noise zones are contained within the base boundary there are no incompatibilities off base associated with the noise zones. Currently, no incompatible land uses have been identified at Bullseye Auxiliary Airfield. However, the USAFA recommends that the City of Colorado Springs, Town of Monument and El Paso County planners work together to ensure that the area within the CZ and APZs remains compatible with the guidelines in Section 3 in the future.

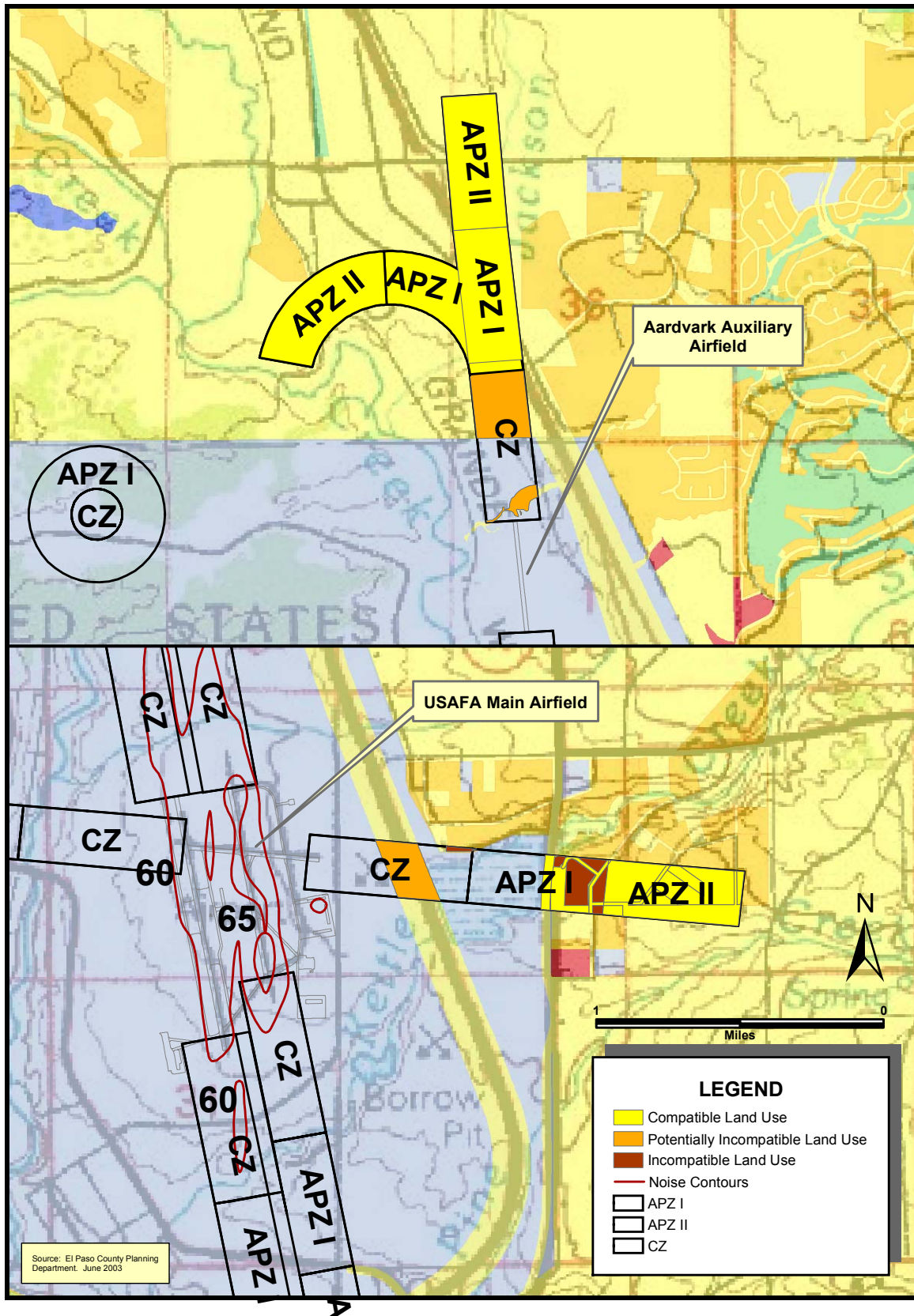


Figure 4-3. Potentially Incompatible Land Use, USAFA

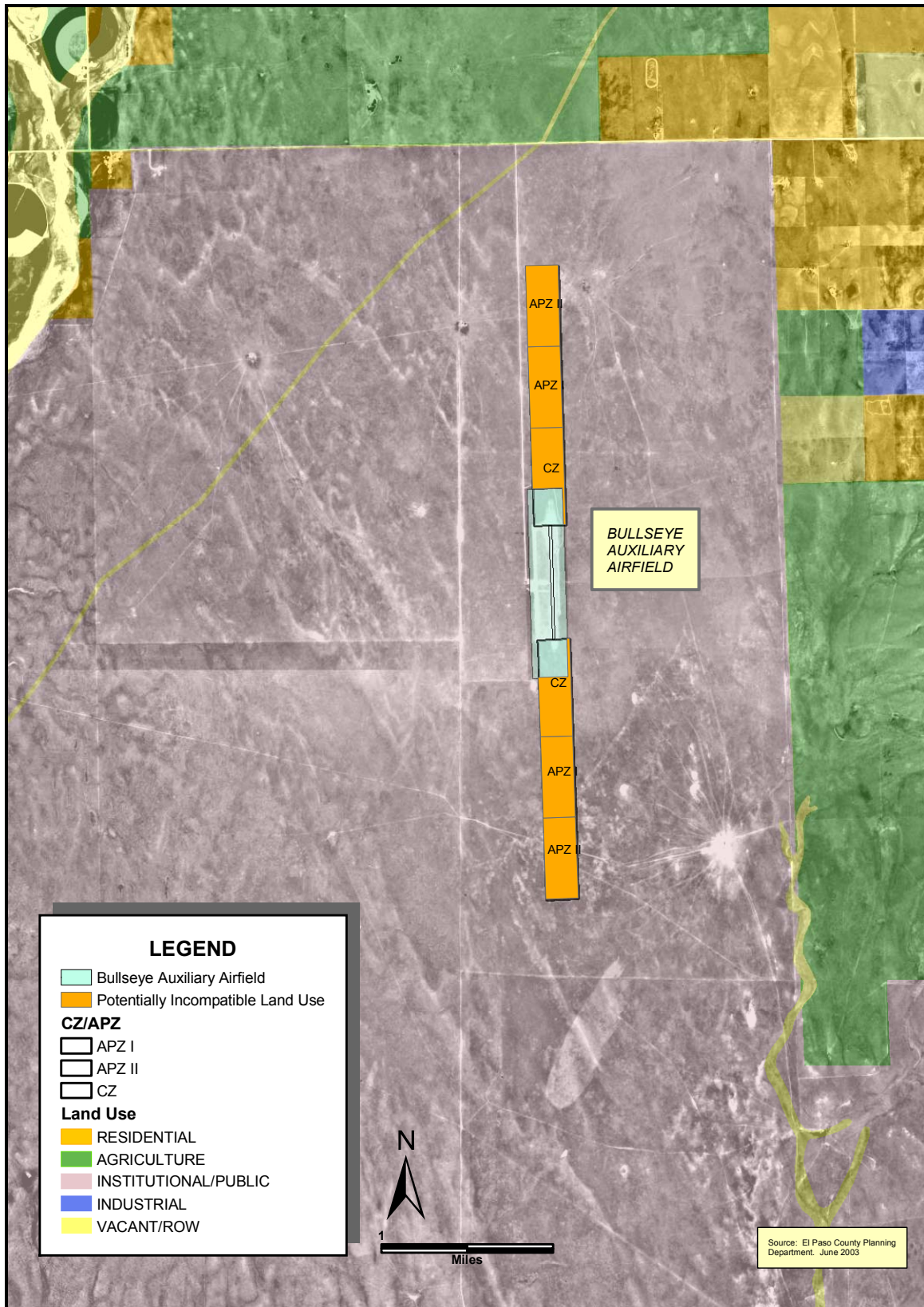


Figure 4-4. Potentially Incompatible Land Use, Bullseye Auxiliary Airfield

4.4 Future Land Use

Existing generalized future land use for the areas adjacent to the USAFA and Bullseye Auxiliary Airfield are shown in Figures 4-5 and 4-6, respectively. Areas immediately east and north of the USAFA are under development pressures from planned commercial, industrial and residential development.

As shown in Figure 4-3, the northern CZ and both APZs associated with Aardvark Auxiliary Airfield at the northeast corner of the Academy extend off the installation onto a portion of the Town of Monument and Interstate Highway 25. The affected areas are primarily zoned industrial, with a small section that is planned for a park, but have not been heavily developed at the time of this study. Currently, the Aardvark Auxiliary Airfield is used by student pilots to practice landing procedures in the motorglider, which helps decrease the amount of traffic at the main airfield. These practice approaches are never flown lower than 50 feet above the ground and aircraft do not land at Aardvark Auxiliary Airfield except in an emergency.

A slight portion of the CZ, the eastern end of APZ I, and all of APZ II associated with the cross-wind runway at the USAFA Airfield extend into El Paso County and the City of Colorado Springs (see Figure 4-1). The affected areas are currently zoned for residential use. Residential use is incompatible within the CZ and APZ I and all residential uses except single detached housing are incompatible within APZ II (See Table 3-1 for a listing of compatible and incompatible land uses for CZ, APZs I and II). Currently, a residence is located in the CZ and a few homes have been built in the APZs.

The land surrounding Bullseye Auxiliary Airfield is owned by the Nature Conservancy or utilized as agriculture. Although the USAF does not own the land within its CZs, the Nature Conservancy precludes any development in this area. Therefore, the land use within the CZs and APZs is compatible with AICUZ recommendations.

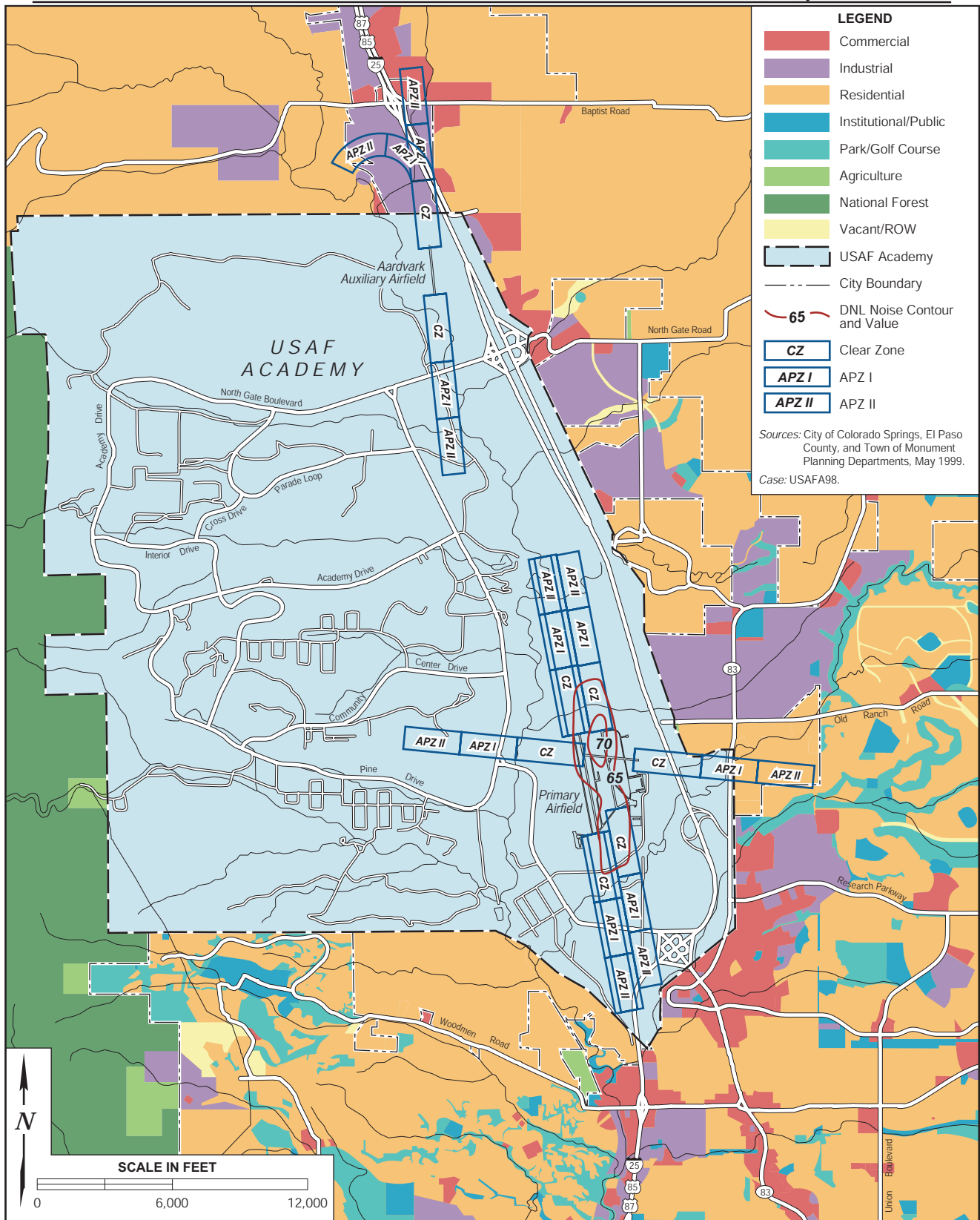


Figure 4-5. Generalized Future Land Use in the Vicinity of the USAFA

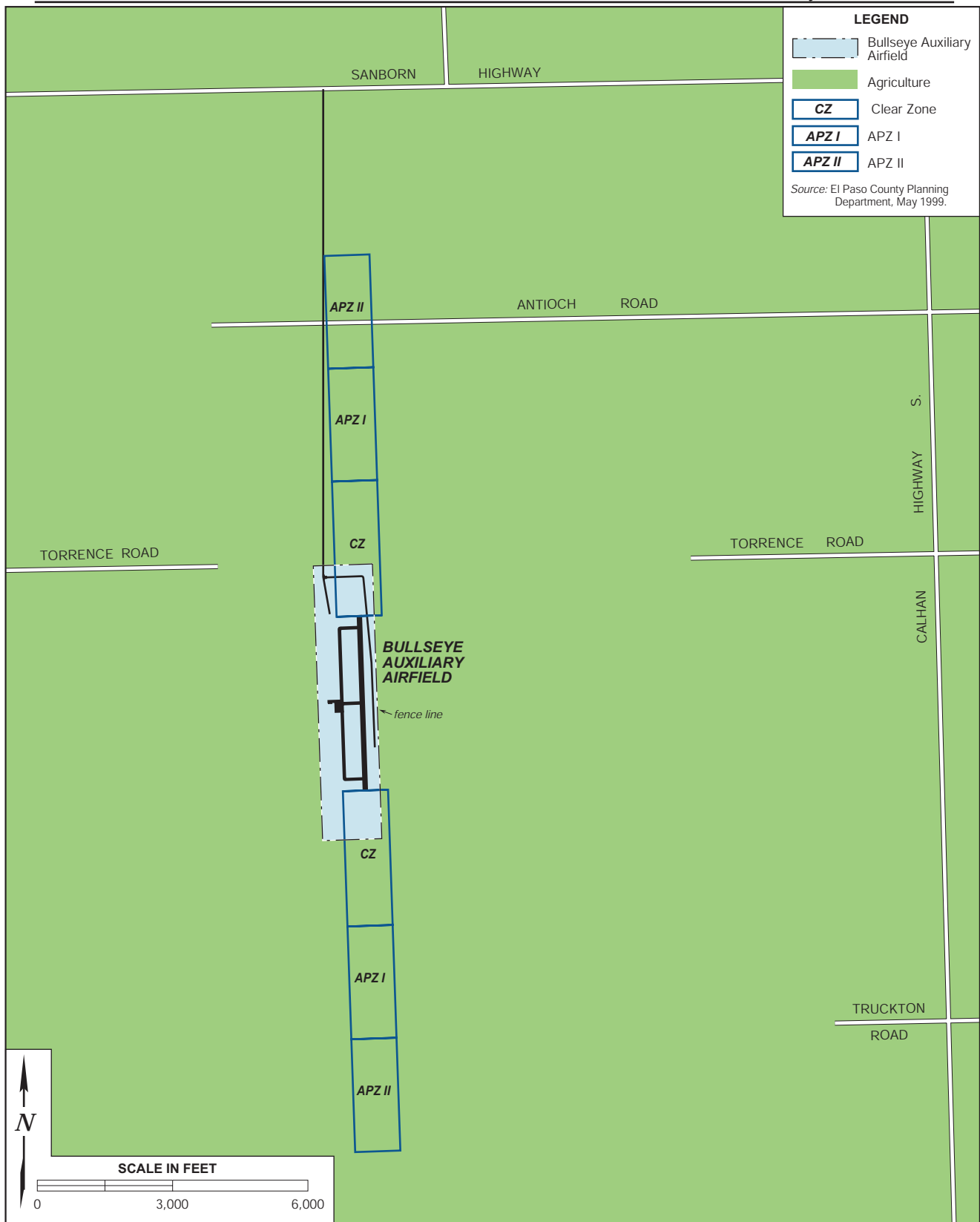


Figure 4-6. Generalized Future Land Use in the Vicinity of Bullseye Auxiliary Airfield

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5. Implementation

Implementation of the AICUZ Study must be a joint effort between USAF and the adjacent communities. The USAF's role is to minimize the impact on local communities from USAFA operations. The role of the communities is to ensure that development in the environs of the installation's airfields is compatible with accepted planning and development principles and practices.

5.1 USAFA Responsibilities

In general, the USAFA perceives its AICUZ responsibilities as encompassing the areas of flying safety, noise abatement, and participation in the land use planning process. Well-maintained aircraft and well-trained aircrews do much to ensure that aircraft accidents are avoided. However, history demonstrates that accidents do occur, particularly in a student training environment. As a result, it is imperative that flights be routed over sparsely populated areas whenever possible to reduce the exposure of lives and property to a potential accident.

USAF regulations require commanders to periodically review existing traffic patterns, instrument approaches, minimum weather conditions under which aircraft can use the airfield (i.e. visibility, ceiling), and operating practices, and to evaluate these factors in terms of their potential to affect populated areas and other local situations. In order to satisfy this requirement, all AICUZ plans must include an analysis of flying and flying-related activities designed to reduce and control the effects of such operations on surrounding land areas.

The USAFA is sensitive to community concerns with regard to noise exposure and has implemented an aircraft noise complaint program. Additionally, in an effort to reduce the noise effects of USAFA operations on surrounding communities, USAFA has routed flight tracks to avoid populated areas as much as possible. Practice takeoffs, landings and instrument approaches are conducted at times when residents in surrounding communities are normally awake. Whenever possible, traffic patterns are located away from population centers, both on and off the installation.

At the USAFA, aircraft operations are evaluated continuously to maintain noise levels at a minimum, both on and off base, in areas such as those developed for housing and education. The following actions, plus other flying and maintenance rules in effect, are examples of noise abatement at the USAFA. All aircraft on-board flight-training is accomplished during daylight hours, weather and air traffic control procedures permitting. All departing aircraft climb as steeply as safely possible to avoid low flight over civilian property while meeting the requirements of air traffic controllers.

The preparation and presentation of this USAFA AICUZ Study is one phase of the USAFA's continuing participation in the local planning process. It is recognized that as local communities update their land use plans, the USAFA must be ready to provide additional input.

It is also recognized that the AICUZ program will be an ongoing activity, even after compatible development plans are adopted and implemented. Base personnel are prepared to participate in the continuing discussion of zoning and other land use matters as they may affect, or may be affected by, USAFA operations. Academy personnel will also be available to provide information, criteria, and guidelines to state and local planning bodies, civic associations, and similar groups.

5.2 Local Community Responsibilities

City of Colorado Springs, the Town of Monument and El Paso County residents have a history of working with personnel at the USAFA to ensure that the Academy is a good neighbor and an integral part of the community. Adoption of the following recommendations will strengthen this relationship, increase the health and safety of the public, and help protect the integrity of the USAFA's flying mission.

- Continue to incorporate AICUZ policies and guidelines into the comprehensive plans of the City of Colorado Springs, the Town of Monument and El Paso County. Overlay clear zones and accident potential zones with Air Force land use guidelines to evaluate existing and future land use proposals.
- Modify existing zoning ordinances to support compatible land uses outlined in this study.
- Assist the USAFA in notifying future land owners via a notice on the final development plats of the potential of aircraft overflight.
- Ensure height and obstruction ordinances for areas near airfields reflect current Air Force and Federal Aviation Regulations Part 77 requirements.
- Continue to inform the USAFA of planning and zoning actions that have the potential to affect base operations. Develop a working group to include city planners, county planners, and the USAFA Airfield Manager to discuss AICUZ concerns and development proposals that could affect airfield operations.
- Sponsor USAFA and Community Information Seminars.
- Ensure Realtors inform potential clients of the USAFA student flight training mission and the potential for noise from flight operations in areas north, east and south of the Academy.

APPENDIX A

AICUZ CONCEPT, PROGRAM, METHODOLOGY, AND POLICIES

APPENDIX A

AICUZ Concept, Program, Methodology, and Policies

A.1 Concept

Federal legislation, national sentiment, and other external forces, which directly affect the United States Air Force (USAF), have greatly increased USAF's role in environmental and planning issues. Problems of airfield encroachment from incompatible land uses surrounding installations, as well as air and water pollution and socioeconomic impact, require continued and persistent USAF involvement. The nature of these issues dictates USAF participation in comprehensive community and land use planning. Effective, coordinated planning involving the federal government and local communities require the establishment of working relationships with citizens, planning officials, and state and federal officials. This planning depends upon creating an atmosphere of mutual trust and helpfulness. The Air Installation Compatible Use Zone (AICUZ) concept has been developed in an effort to:

- Protect local citizens from the noise exposure and accident potential associated with flying activities, and
- Prevent degradation of the USAF's capability to achieve its mission by promoting compatible land use planning.

Land use guidelines developed herein are a composite of a number of other land use compatibility studies that have been refined to fit the USAFA aviation environment.

A.2 Program

Installation Commanders establish and maintain programs to achieve the maximum feasible land use compatibility between air installations and neighboring communities. The program requires that all appropriate governmental bodies and citizens be fully informed whenever AICUZ or other planning matters affecting the installation are under consideration. This includes programs designed to:

- Provide information, criteria, and guidelines to federal, state, regional, and local planning bodies, civic associations, and similar groups;
- Inform such groups of the requirements of the flying activity, noise exposure, aircraft accident potential, and AICUZ plans;
- Describe noise reduction measures that are being used; and

- Ensure that all reasonable, economical, and practical measures are taken to reduce or control the impact of noise-producing activities. These measures include such considerations as proper location of engine test facilities, provision for sound suppressers where necessary, and adjustment of flight patterns and/or techniques to minimize the noise impact on populated areas.

A.3 Methodology

The AICUZ program analyzes land areas upon which certain land uses may obstruct airspace use or otherwise be hazardous to aircraft operations; and land areas, which are exposed to the safety hazards of aircraft operations. The AICUZ Study includes:

- Depiction of accident potential zones (APZs) and clear zones (CZs) based on past USAF aircraft accidents and installation operational data (Appendix B);
- Noise zones (NZs) developed using NOISEMAP modeling program, which depicts NZs in terms of Day-Night Average A-Weighted Sound Level (DNL) metric (Appendix C); and
- The area designated by the Federal Aviation Administration and the USAF for height limitations in approach and departure zones of the base (Appendix D).

The APZs, CZs, and NZs are the basic building blocks for land use planning in the AICUZ Study process. Compatible land uses are specified for these zones in Appendix B.

As part of the AICUZ program, the only real property acquisition for which the USAF has received congressional authorization, and the base and Major Commands request appropriation, are the areas designated as CZs. Real property interests are acquired by fee or easement giving the base control over use of the property. Fee acquired land may be leased out for agricultural or grazing purposes. The USAFA has land use control within the CZs associated with the USAFA Airfield and the southern CZ associated with Aardvark Auxiliary Airfield by ownership. A portion of the Aardvark Auxiliary Airfield northern CZ is not owned by the USAFA and is currently zoned industrial by the Town of Monument. A portion of the CZs associated with the Bullseye Auxiliary Airfield have not been acquired by the USAFA and are currently used for farming and ranching under the jurisdiction of El Paso County. Compatible land use controls for the remaining airfield environs should be accomplished through the community land use planning processes.

A.4 AICUZ Land Use Development Policies

The basis for any effective land use control system is the development of and adherence to policies that set the standard by which all land use planning and control actions are evaluated. USAFA recommends that the following policies are considered for incorporation into the comprehensive plans of agencies in the vicinity of the base environs, unless otherwise specified below.

A.4.1 Policy 1

In order to promote public health, safety, peace, comfort, convenience, and general welfare of the inhabitants of airfield environs, it is necessary to:

- Guide, control, and regulate future growth and development;
- Promote orderly and appropriate land use;
- Protect the character and stability of existing land uses;
- Prevent the destruction or impairment of the airfield and the public investment therein;
- Enhance the quality of living in the areas affected; and
- Protect the general economic welfare by restricting incompatible land use.

A.4.2 Policy 2

In conjunction with Policy 1, it is appropriate to:

- Establish land use compatibility guidelines;
- Restrict or prohibit incompatible land use;
- Prevent land use which would unreasonably endanger aircraft operations and the continued use of the airfield;
- Incorporate the AICUZ concept into community land use plans, modifying these plans when necessary; and
- Adopt appropriate ordinances to implement airfield environs land use plans.

A.4.3 Policy 3

Within the boundaries of the CZ, certain land uses are inherently incompatible. The following land uses are not in the public interest and must be restricted or prohibited:

- Uses that release any substance into the air, such as steam, dust, or smoke, which would impair visibility or otherwise interfere with the operation of aircraft;

- Uses that produce light emissions, either direct or indirect (reflective), which would interfere with pilot vision;
- Uses that produce electrical emissions which would interfere with aircraft communication systems or navigation equipment;
- Uses that attract birds or waterfowl, such as operation of sanitary landfills, maintenance of feeding stations, or growth of certain vegetation; and
- Uses that place structures within ten feet of aircraft approach-departure and/or transitional surfaces.

A.4.4 Policy 4

Since the USAFA noise contours do not extend off base, this policy does not apply to planning agencies in the vicinity of USAFA. Certain noise levels of varying duration and frequency create hazards to both physical and mental health. A limited, though definite, danger to life exists in certain areas adjacent to airfields. Where these conditions are sufficiently severe, it is not consistent with public health, safety, and welfare to allow the following land uses:

- Residential;
- Retail business;
- Office buildings;
- Public buildings (e.g. schools, churches, hospitals); and
- Recreational buildings and structures.

A.4.5 Policy 5

Land areas below takeoff and final approach flight paths are exposed to significant danger from aircraft accidents. The density of development and intensity of use must be limited in such areas.

A.4.6 Policy 6

Since the USAFA noise contours do not extend off base, this policy does not apply to planning agencies in the vicinity of USAFA. Different land uses have different sensitivities to noise. Standards of land use acceptability should be adopted, based on these noise sensitivities. In addition, noise level reduction measures for new construction should be implemented to permit certain uses where they would otherwise be prohibited.

A.4.7 Policy 7

Land use planning and zoning in airfield environs cannot be based solely on aircraft effects. Allocation of land used within the AICUZ should be further refined by:

- Physiographic factors;
- Climate and hydrology;
- Vegetation;
- Surface geology;
- Soil characteristics;
- Intrinsic land use potential and constraints;
- Existing land use;
- Land ownership patterns and values;
- Economic and social demands;
- Cost and availability of public utilities, transportation, and community facilities; and
- Other noise sources.

A.5 Basic Land Use Compatibility

Compatibility guidelines must not be considered inflexible standards. They are the framework within which land use compatibility questions can be addressed and resolved. In each case, full consideration must be given to local conditions such as:

- Previous community experience with aircraft accidents and noise;
- Local building construction and development practices;
- Existing noise due to other urban or transportation noise sources;
- Time period of aircraft operations and land use activities;
- Specific site analysis; and
- Noise buffers, including topography.

Although these basic guidelines cannot resolve all land use compatibility issues they offer a reasonable framework within which to work.

A.6 Accident Potential

Land use guidelines for the two types of APZs are based on a hazard index system, which evaluates the probability of accident occurrence for five areas:

- On or adjacent to the runway;
- Within the clear zone;
- In APZ I;
- In APZ II; and
- In all other areas within a 10 nautical mile (NM) radius of the runway.

Accident potential on or adjacent to the runway or within the CZ is so high that few land use activities are acceptable. The risk outside APZ I and APZ II, but within the 10 NM radius area, is significant, but is acceptable for most land use categories if sound engineering and planning practices are followed.

Each runway end at the three Academy airfields has a CZ and two APZs (Appendix B). Accident potential on or adjacent to the runway or within the CZ is so high that land use restrictions prohibit economic use of the land. The CZs for the Class A runways at the three Academy airfields are 1,000 feet wide by 3,000 feet long. As stated previously, it is USAF policy to request Congress to authorize and appropriate funds for the necessary real property interests in this area to prevent incompatible land uses. Currently not all CZs are located within the USAFA property boundary. Ownership of the CZs would allow the USAFA to restrict any development in these areas. However, the USAFA has worked with the Town of Monument, the City of Colorado Springs, and El Paso County to place easements on these areas to limit any development in these areas. The CZs that are not within the USAFA property boundaries are the CZ at the north end of Aardvark Auxiliary Airfield, a small portion of the eastern CZ of Runway 08/26, and a portion of both ends of the Bullseye Auxiliary Airfield.

Land use guidelines for APZs I and II have been developed. The main objective has been to restrict all people-intensive uses because there is measurable risk in these areas. The basic guidelines aim at prevention of uses that:

- Have high residential density characteristics;
- Have high labor intensity;
- Involve above-ground explosive, fire, toxic, corrosive, or other hazardous characteristics;

- Promote population concentrations;
- Involve utilities and services required for area-wide population, where disruption would have an adverse impact (e.g. telephone, gas);
- Concentrate people who are unable to respond to emergency situations, such as children, the elderly, and the handicapped; and
- Pose hazards to aircraft operations.

APZ I is less critical than the CZ, but still possesses a significant risk factor. This 1,000 foot by 2,500 foot area has land use compatibility guidelines that are sufficiently flexible to allow reasonable economic use of the land, such as industrial/manufacturing, transportation, communication/utilities, wholesale trade, open space, recreation, and agriculture. However, uses (e.g., some recreational activities) that concentrate people in small areas are not acceptable.

APZ II is less critical than APZ I, but still possesses potential for accidents. APZ II, also 1,000 feet wide, is 2,500 feet long extending to 8,000 feet from the runway threshold. Acceptable uses include those of APZ I, along with low-density, single-family residential outside of the 65 DNL noise contour; and personal and business services and commercial/retail trade uses of low intensity or scale of operation. High density functions such as multi-story buildings, places of assembly (e.g., theaters, churches, schools, and restaurants), and high density office uses are not considered appropriate.

High densities of people should be limited to the maximum extent possible within APZ I and APZ II. The optimum density recommended for residential usage in APZ II is one to two dwellings per acre. For most non-residential usage, buildings should be limited to one story and lot coverage should not exceed 20 percent.

Although these guidelines are relative, there should ideally be no people-intensive uses in either APZ I or II. Free market and private property systems prevent this where there is land development demand; however, to go beyond these guidelines substantially increases risk by placing more people in areas where there may ultimately be an aircraft accident.

A.7 Noise

Nearly all studies on residential aircraft noise compatibility recommend no residential uses in noise zones above DNL 75 decibels (dB). Usually, no restrictions are recommended below noise zone DNL 65 dB. Between DNL 65-75 dB there is currently no consensus; these areas may not qualify for federal mortgage insurance in residential categories according to the U.S. Department of Housing and Urban Development (HUD) (24 Code of Federal Regulations 51B). In many cases, HUD approval

requires noise attenuation measures, the HUD Regional Administrator's concurrence, and an Environmental Impact Statement. The Department of Veterans Affairs also has airfield noise and accident potential restrictions which apply to their home loan guarantee program. Whenever possible, residential land use should be located in areas of noise exposure below DNL 65 dB according to USAF land use recommendations.

Most industrial/manufacturing uses are compatible in the airfield environs. Exceptions are uses such as research or scientific activities, which require lower noise levels. Noise attenuation measures are recommended for portions of buildings devoted to office use, receiving the public, or where the ambient, background noise level is low.

The transportation, communications, and utilities categories are typically compatible with high noise levels because they generally are not people-intensive. When people use land for these purposes, their use is generally very short in duration. Where buildings are required for these uses, additional evaluation is warranted.

The commercial/retail trade, and personal and business services categories are compatible without restriction in areas of noise exposure up to DNL 70 dB; however, they are generally incompatible above DNL 80 dB. Between DNL 70-80 dB, noise level reduction measures should be included in the design and construction of buildings.

The nature of most uses in the public and quasi-public services category requires a quieter environment, and attempts should be made to locate these uses in areas of noise exposure below DNL 65 dB (a USAF land use recommendation), or else provide adequate noise level reduction.

Although recreational use has often been considered as compatible with high noise levels, recent research has resulted in a more conservative view. Above DNL 75 dB, noise exposure limits the ability to enjoy such uses. Where the requirement to hear is a function of the use (e.g., music shell), compatibility is limited. Buildings associated with golf courses and similar uses should also be noise attenuated.

With the exception of forestry activities and livestock farming, uses in the resources production, extraction, and open space category are generally compatible almost without restrictions

APPENDIX B

ACCIDENT POTENTIAL ZONES

APPENDIX B

Accident Potential Zones

B.1 Guidelines for Accident Potential

Urban areas around airports are exposed to the possibility of aircraft accidents even with well-maintained aircraft and highly trained aircraft crews. Despite stringent maintenance requirements and countless hours of training, past history makes it clear that accidents are going to occur.

When the Air Installation Compatible Use Zone program began, there were no current comprehensive studies on accident potential. In support of the program, the United States Air Force (USAF) completed a study of USAF accidents that occurred between 1968 and 1972 within 10 nautical miles (NM) of airfields regardless of runway classification. The study of 369 accidents revealed that 75 percent of aircraft accidents occurred on or adjacent to the runway (1,000 feet to each side of the runway centerline) and in a corridor 3,000 feet (1,500 feet either side of the runway centerline) wide, extending from the runway threshold along the extended runway centerline for a distance of 15,000 feet.

Three zones were established based on crash patterns for the USAFA's Class A runways: The clear zone (CZ), accident potential zone (APZ) I, and APZ II. All three zones are 1,000 feet wide. The CZ starts at the end of the runway and extends outward 3,000 feet. It has the highest accident potential of the three zones. The USAF has adopted a policy of acquiring property rights to areas designated as CZs because of the high accident potential. APZ I extends from the CZ an additional 2,500 feet. It includes an area of reduced accident potential. APZ II extends from APZ I an additional 2,500 feet in an area of further reduced accident potential. The total linear distance from the centerline of the runway of the CZ, APZ I, APZ II is 8,000 feet.

The USAF research work in accident potential was the first significant effort in this subject area since 1952 when the President's Airport Commission published "The Airport and Its Neighbors," better known as the "Doolittle Report." The recommendations of this earlier report were influential in the formulation of the APZ concept.

The risk to people on the ground of being killed or injured by aircraft accidents is small. However, an aircraft accident is a high consequence event and when a crash does occur, the result is often catastrophic. Because of this, the USAF does not attempt to base its safety standards on accident probabilities. Instead the USAF approaches this safety issue from a land use planning perspective.

B.2 Accident Potential Analysis

Military aircraft accidents differ from commercial air carrier and general aviation accidents because of the variety of aircraft used, the type of missions, and the number of training flights. In 1973, the USAF performed an aircraft accident hazard study in order to identify land near airfields with significant accident potential. Accidents studied occurred within 10 NM of airfields.

The study reviewed 369 major USAF accidents during 1968-1972, and found that 61 percent of the accidents were related to landing operations and 39 percent were takeoff related. It also found that 70 percent occurred in daylight, and that fighter and training aircraft accounted for 80 percent of the accidents.

Because the purpose of the study was to identify accident hazards, the study plotted each of the 369 accidents in relation to the airfield (Table B-1). This plotting found that the accidents clustered along the runway and its extended centerline. To further refine this clustering, a tabulation was prepared which described the cumulative frequency of accidents as a function of distance from the runway centerline along the extended centerline. This analysis was done for widths of 2,000, 3,000, and 4,000 total feet.

Table B-1. Accident Location Analysis

Width of Runway Extension (feet)	Length From both Ends of Runway (feet)		
	2,000	3,000	4,000
Percent of Accidents			
On or adjacent to runway (1,000 feet to each side of runway centerline)	23	23	23
0 to 3,000	35	39	39
3,000 to 8,000	8	8	8
8,000 to 15,000	5	5	7
Cumulative percent of accidents			
On or adjacent to runway (1,000 feet to each side of runway centerline)	23	23	23
0 to 3,000	58	62	62
3,000 to 8,000	66	70	70
8,000 to 15,000	71	75	77

Figure B-1 indicates that the cumulative number of accidents rises rapidly from the end of the runway to 3,000 feet, rises more gradually to 8,000 feet, then continues at about the same rate of increase to 15,000 feet, where it levels off rapidly. The location analysis also indicates that the optimum width of the runway extension, which would include the maximum percentage of accidents in the smallest area, is 3,000 feet.

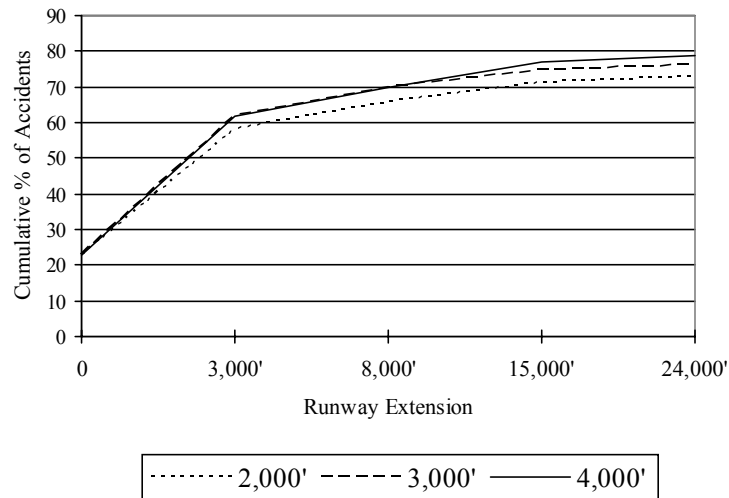


Figure B-1. Distribution of Air Force Aircraft Accidents

Using the optimum runway extension width of 3,000 feet, and the cumulative distribution of accidents from the end of the runway, CZs and APZs were established which minimized the land area included and maximized the percentage of accidents included. Zone dimensions and accident statistics for the 1968-1972 study are shown in Figure B-2.

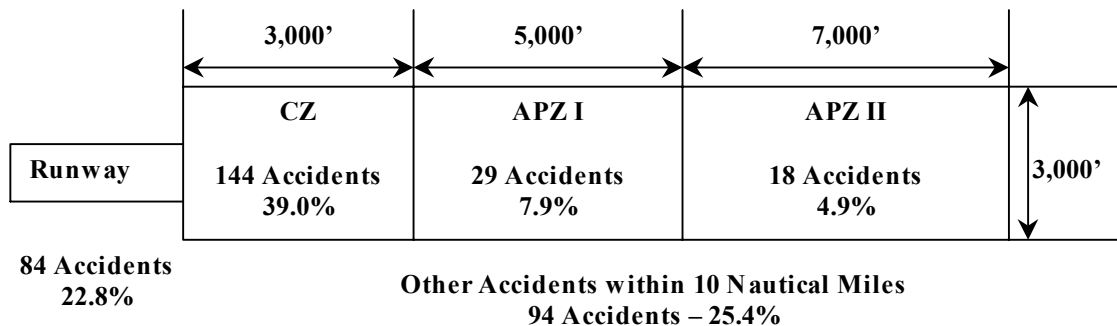


Figure B-2. Air Force Accident Data (369 Accidents from 1968 to 1972)

The original study was updated to include accidents through September 1995, and now includes 838 accidents during the 1968-1995 time period (Figure B-3).

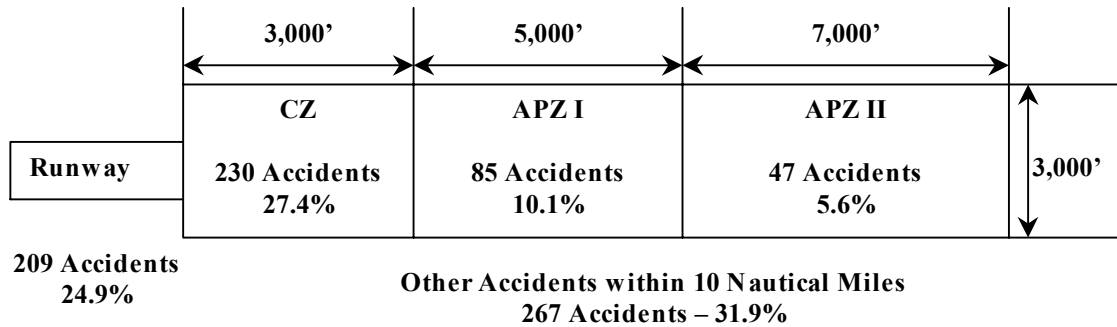


Figure B-3. Air Force Accident Data (838 Accidents from 1968 to 1995)

Using the designated zones and accident data, it is possible to calculate a ratio of percentage of accidents to percentage of area size. These ratios, shown in Table B-2, indicate that the CZ, with the smallest area size and the highest number of accidents, has the highest ratio, followed in decreasing order by the runway and adjacent area, APZ I, and APZ II.

Table B-2. Accident-to-Area Ratio

Ratio of Percentage of Accidents to Percentage of Area (Air Force Accident Data 1968 - 1995)						
	Area (acres) ¹	Number of Accidents ²	Accidents per Acre	% Total Area	% Total Accidents	Ratio: Accidents to Area ³
Runway Area ⁴	487	209	1 per 2.3	0.183	24.9	136.
CZ	413	226	1 per 1.8	0.155	27.4	177.
APZ I	689	85	1 per 8.1	0.258	10.1	39.
APZ II	964	47	1 per 20.5	0.362	5.6	15.
Other	264,053	267	1 per 989.	99.042	31.9	0.3

¹ Area includes land within 10 nautical miles of runway (266,606 acres).

² Total number of accidents is 838 (through 1995).

³ Percent total accidents divided by percent total area.

⁴ Runway dimension is 2,000' X 10,600'.

B.3 Definable Debris Impact Areas

The USAF also determined which accidents had definable debris impact areas, and in what phase of flight the accident occurred. Overall, 75 percent of the accidents had definable debris impact areas, although they varied in size by type of accident. The USAF used weighted averages of impact areas,

for accidents occurring only in the approach and departure phases, to determine the following average impact areas:

- overall average impact area: 5.1 acres,
- fighter, trainer, and miscellaneous aircraft: 2.7 acres, and
- heavy bomber and tanker aircraft: 8.7 acres.

B.4 Findings

Designation of safety zones around the airfield and restriction of incompatible land uses can reduce the public's exposure to safety hazards. USAF accident studies have found that aircraft accidents near USAF installations occurred in the following patterns:

- 61% were related to landing operations;
- 39% were related to takeoff operations;
- 70% occurred in daylight;
- 80% were related to fighter and training aircraft operations;
- 25% occurred on the runway or within an area extending 1,000 feet out from each side of the runway;
- 27% occurred in an area extending from the end of the runway to 3,000 feet along the extended centerline and 3,000 feet wide, centered on the extended centerline; and
- 15% occurred in an area between 3,000 and 15,000 feet along the extended runway centerline and 3,000 feet wide, centered on the extended centerline.

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APPENDIX C

DESCRIPTION OF THE NOISE ENVIRONMENT

APPENDIX C

Description of the Noise Environment

C.1 Noise Environment Descriptor

The noise contour methodology used herein is the Day-Night Average A-Weighted Sound Level (DNL) metric of describing the noise environment. Efforts to provide a national uniform standard for noise assessment have resulted in adoption by the U.S. Environmental Protection Agency of DNL as the standard noise descriptor. The United States Air Force (USAF) uses the DNL descriptor in assessing the amount of aircraft noise exposure, and as a metric for community response to the various levels of exposure. The DNL values used for planning purposes are 65, 70, 75, and 80 decibels (dB). Land use guidelines are based on the compatibility of various land uses with these noise exposure levels.

It is generally recognized that a noise environment descriptor should consider, in addition to the annoyance of a single event, the effect of repetition of such events and the time of day in which these events occur. DNL begins with a single event descriptor and adds corrections for the number of events and the time of day. Since the primary development concern is residential, nighttime events are considered more annoying than daytime events and are weighted accordingly. DNL values are computed from the single event noise descriptor, plus corrections for number of flights and time of day (Figure C-1).

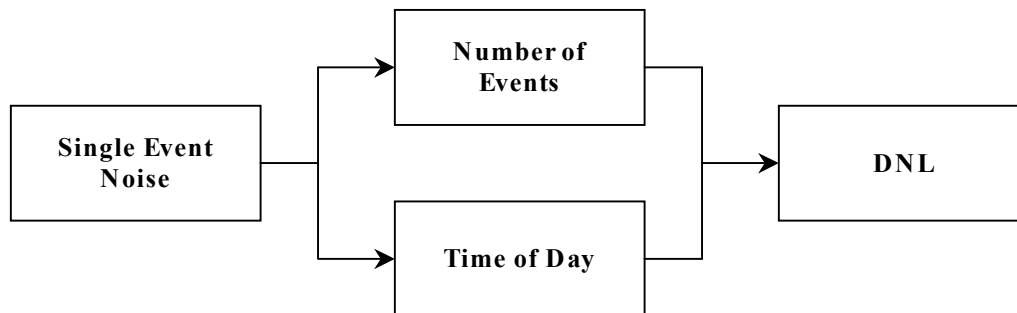


Figure C-1. Day-Night Average A-Weighted Sound Level (DNL)

Noise is represented by a variety of quantities or “metrics.” Each noise metric was developed to account for the type of noise and the nature of what may be exposed to the noise. Human hearing is more sensitive to medium and high frequencies than to low and very high frequencies, so it is common to use “A-weighted” metrics which account for this.

As part of the extensive data collection process, detailed information is gathered on the type of aircraft, the number of operations, and time of day of flying operations for each flight track during a typical day. This information is used in conjunction with the single event noise descriptor to produce DNL values. These values are combined on an energy summation basis to provide single DNL values for the mix of aircraft operations at the base. Equal value points are connected to form contour lines which encompass and depict areas exposed to a range of noise levels.

C.2 Noise Event Descriptor

The single event noise descriptor used in the DNL system is the Sound Exposure Level. The Sound Exposure Level measure is an integration of DNL over the period of a single event such as an aircraft flyover, measured in dB.

Frequency, magnitude, and duration vary according to aircraft type, engine type, and power setting. Therefore, individual aircraft noise data are collected for various types of aircraft/engines at different power settings and phases of flight. Figure C-2 shows the relationship of the single event noise descriptor to the source sound energy.

Sound Exposure Level versus slant-range values are derived from noise measurements made according to a source noise data acquisition plan developed by Bolt, Beranek, and Newman, Inc., in conjunction with and implemented by the USAF's Armstrong Laboratory. These standard day sea level values, form the basis for individual event noise descriptors at any location. These values are adjusted to the location by applying appropriate corrections for temperature, humidity, and variations from standard profiles and power settings of each aircraft.

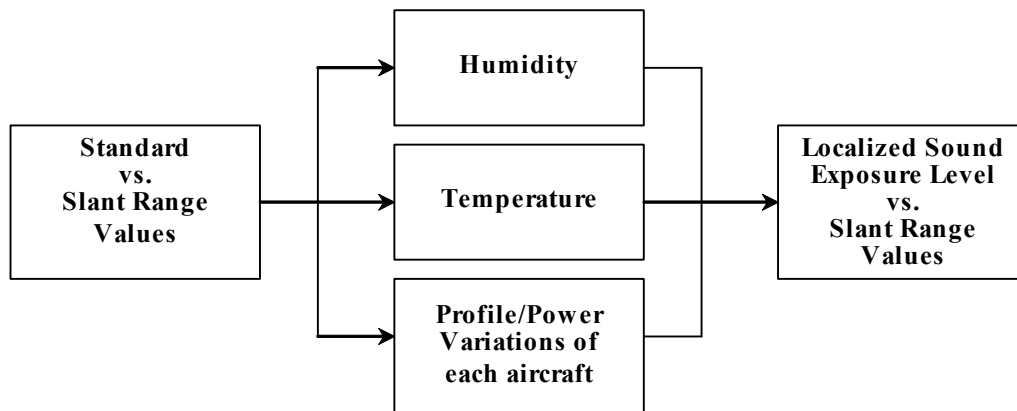


Figure C-2. Sound Exposure Level

Ground-to-ground sound propagation characteristics are used for altitudes up to 500 feet with linear transition between 500 and 700 feet and air-to-ground propagation characteristics above 700 feet.

In addition to the assessment of aircraft flight operations, the DNL system also incorporates noise resulting from engine/aircraft maintenance checks on the ground. Ground run up or test position data concerning the orientation of the noise source, type of aircraft or engine, number of test runs on a typical day, power settings used and their duration, and use of suppression devices are collected. This information is processed and the noise contribution added (on an energy summation basis) to the noise generated by flying operations to produce noise contours reflecting the overall noise environment with respect to aircraft air and ground operations.

C.3 Noise Contour Production

Each individual Air Force Base assembles data describing flight track distances and turns, altitudes, airspeeds, power settings, flight track operational utilization, maintenance locations, ground run-up engine power settings, and number and duration of runs by type of aircraft/engine. The data is screened by the Major Command and Headquarters Air Force Center for Environmental Excellence. Personnel encode the data for computer processing. Then the flight track maps are generated for verification and approval by the base or Major Command. After any required changes have been incorporated, the computer generates DNL contours using the supplied data and standard source noise data corrected to local weather conditions. These contours are plotted and prepared for reproduction. A set of these contours is provided in the body of the report.

C.4 Technical Information

Additional technical information on the DNL procedures is available in the following publications:

- Community Noise Exposure Resulting from Aircraft Operations: Applications Guide for Predictive Procedure, AMRL-TR-73-105, November, 1974, from National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22151.
- Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with Adequate Margin of Safety, EPA Report 550/9-74-004, March, 1974, from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.
- Adopted Noise Regulations for California Airports, Title 4, Register 70, No. 48-11-28-70, Subchapter 6, Noise Standards.

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APPENDIX D

HEIGHT AND OBSTRUCTIONS CRITERIA

APPENDIX D

Height and Obstructions Criteria

D.1 Height and Obstructions Criteria

D.1.1 General

This appendix establishes criteria for determining whether an object or structure is an obstruction to air navigation. Obstructions to air navigation include:

- Natural objects or human-made structures that protrude above the planes or surfaces as defined in the following paragraphs; and/or
- Human-made objects that extend more than 500 feet above the ground at the site of the structure.

D.1.2 Explanation of Terms

The following will apply (see Figure D-1):

- Controlling Elevation. Whenever surfaces or planes within the obstruction criteria overlap, the controlling (or governing) elevation becomes that of the lowest surface or plane.
- Runway Length. U.S. Air Force Academy (USAFA) Airfield has four runways: Runway 16L-34R is 3,500 feet long; Runway 16C-34C is 4,500 feet long; Runway 16R-34L is 4,500 feet long; and Runway 26-08 is 2,175 feet long. The Aardvark Auxiliary Airfield has a 2,100 foot runway oriented 17/35 and Bullseye Auxiliary Airfield has a 3,500 foot runway oriented 17/35. These runways are constructed of pavement designed and built for sustained aircraft landings and takeoffs.
- Established Airfield Elevation. The elevation of USAFA is 6,572 feet above mean sea level. The elevation of Bullseye Auxiliary Airfield is 6,036 feet above mean sea level.
- Dimensions. All dimensions are measured horizontally unless otherwise noted.

For a more complete description of airspace and control surfaces for Class A and Class B runways, refer to Federal Aviation Regulation (FAR) Part 77, Subpart C, or Air Force Instruction 32-1026.

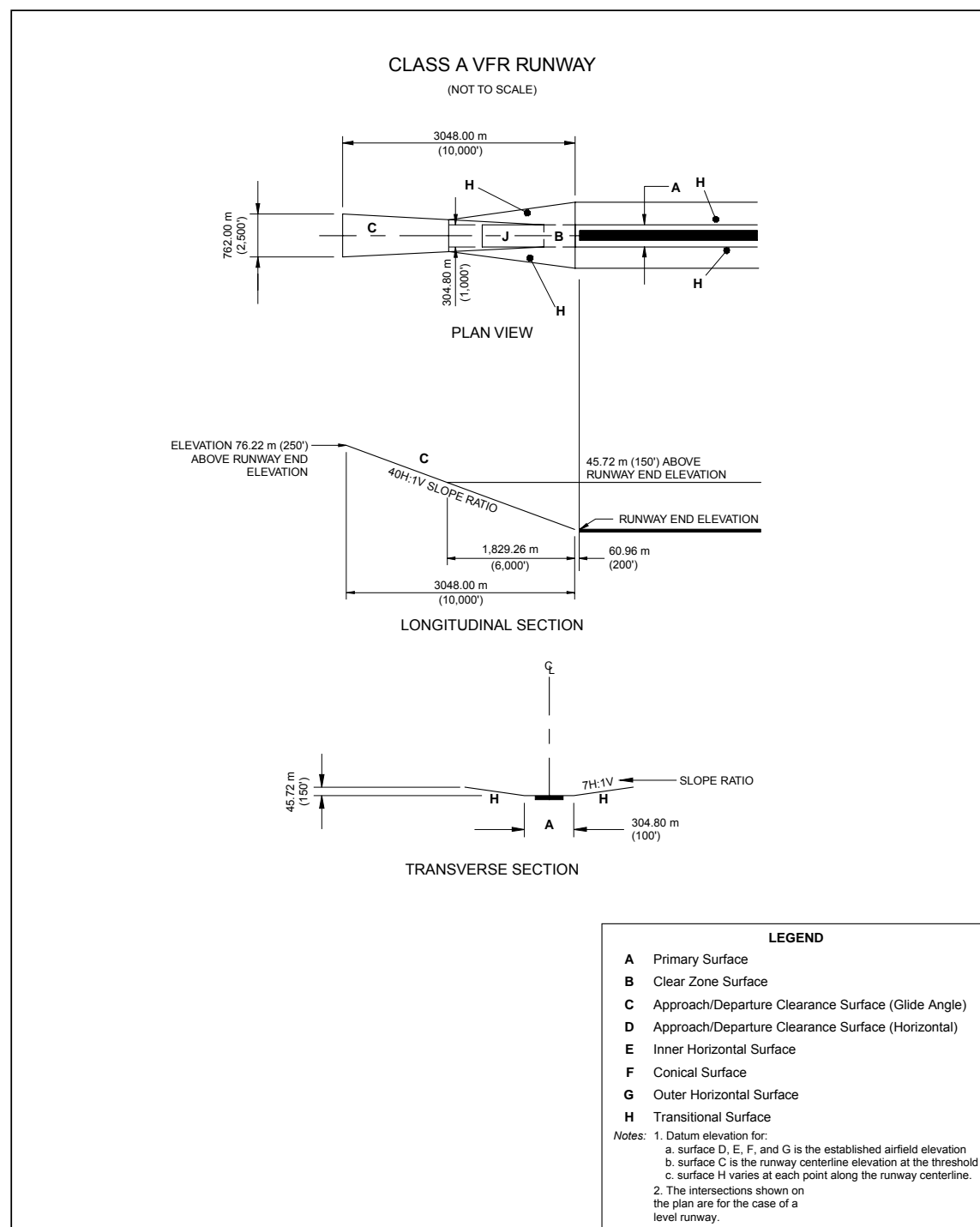


Figure D-1. Airspace Control Surface Plan

D.1.3 Planes and Surfaces

Definitions are as follows:

PRIMARY SURFACE

- This surface defines the limits of the obstruction clearance requirements in the immediate vicinity of the landing area;
- Comprises surfaces of the runway, runway shoulders, and lateral safety zones and extends 200 feet beyond the runway end; and
- For a single class “A” runway, is 1,000 feet wide, or 500 feet on each side of the runway centerline.

CLEAR ZONE (CZ) SURFACE

- This surface defines the limits of the obstruction clearance requirements in the vicinity contiguous to the end of the primary surface; and
- For a single runway end, measures 3,000 feet long by 1,000 feet wide.

APPROACH-DEPARTURE CLEARANCE SURFACE

- This surface is symmetrical from the extended runway centerline, it is an inclined plane (glide angle) beginning 200 feet beyond each end of the primary surface of the centerline of the runway end, and extends for 10,000 feet;
- The slope of the approach-departure clearance surface is 40:1 along the extended runway (glide angle) centerline until it reaches an elevation of 250 feet above the established airfield elevation;
- The width of this surface at the beginning of the sloped portion is 1,000 feet; it flares uniformly, and the width at 10,000 feet is 2,500 feet.

Transitional Surfaces

- These surfaces connect the primary surfaces, CZ surfaces, and approach-departure clearance surfaces to other horizontal or transitional surfaces;
- The slope of the transitional surface is 7:1 outward and upward at right angles to the runway centerline;
- To determine the elevation for the beginning of the transitional surface slope at any point along the lateral boundary of the primary surface, including the CZ, draw a line from this point to the runway centerline;
- This line will be at right angles to the runway axis; and
- The elevation at the runway centerline is the elevation for the beginning of the 7:1 slope.

The land areas outlined by these criteria should be regulated to prevent uses which might be hazardous to aircraft operations. The following uses should be restricted and/or prohibited:

- Uses which release any substance into the air which would impair visibility or otherwise interfere with the operation of aircraft (i.e. steam, dust, or smoke);
- Produce light emissions, either direct or indirect (reflective), which would interfere with pilot vision;
- Produce electrical emissions which would interfere with aircraft communications systems or navigational equipment;
- Would attract birds or waterfowl, including but not limited to, operation of sanitary landfills, maintenance of feeding stations, or the growing of certain vegetation; and
- Uses that provide for structures within 10 feet of aircraft approach-departure and/or transitional surfaces.

D.2 Height Restrictions

City/County agencies involved with approvals of permits for construction should require developers to complete a form titled *Notice on Proposed Construction or Alteration* (Federal Aviation Administration Form 7460-1), which shows that projects meet the height restriction criteria of FAR Part 77. This criteria is described, in part, by the information contained in this appendix. Airfield elevation and runway coordinates for the USAFA Airfield and the Aardvark and Bullseye Auxiliary Airfields are listed below.

USAFA Airfield Elevation: 6,572

Runway Coordinates: 08			
Start:	38 Degrees	58 Minutes	33.50 Seconds North Latitude
	104 Degrees	49 Minutes	19.30 Seconds West Longitude
Runway Coordinates: 26			
Start:	38 Degrees	58 Minutes	31.30 Seconds North Latitude
	104 Degrees	48 Minutes	50.50 Seconds West Longitude
Runway Coordinates: 16L			
Start:	38 Degrees	58 Minutes	44.20 Seconds North Latitude
	104 Degrees	49 Minutes	8.60 Seconds West Longitude
Runway Coordinates: 34R			
Start:	38 Degrees	58 Minutes	9.90 Seconds North Latitude
	104 Degrees	49 Minutes	0.40 Seconds West Longitude
Runway Coordinates: 16C			
Start:	38 Degrees	58 Minutes	42.90 Seconds North Latitude
	104 Degrees	49 Minutes	21.00 Seconds West Longitude

Runway Coordinates: 34C

Start: 38 Degrees 57 Minutes 59.10 Seconds North Latitude
104 Degrees 49 Minutes 10.70 Seconds West Longitude

Runway Coordinates: 16R

Start: 38 Degrees 58 Minutes 42.40 Seconds North Latitude
104 Degrees 49 Minutes 24.30 Seconds West Longitude

Runway Coordinates: 34L

Start: 38 Degrees 57 Minutes 58.70 Seconds North Latitude
104 Degrees 49 Minutes 13.80 Seconds West Longitude

Aardvark Auxiliary Airfield Elevation: 6,572 feet

Runway Coordinates: 17

Start: 39 Degrees 02 Minutes 16.20 Seconds North Latitude
104 Degrees 50 Minutes 43.10 Seconds West Longitude

Runway Coordinates: 35

Start: 39 Degrees 01 Minutes 55.50 Seconds North Latitude
104 Degrees 50 Minutes 40.50 Seconds West Longitude

Bullseye Auxiliary Airfield Elevation: 6,036 feet

Runway Coordinates: 17

Start: 38 Degrees 46 Minutes 17.10 Seconds North Latitude
104 Degrees 18 Minutes 3.60 Seconds West Longitude

Runway Coordinates: 35

Start: 38 Degrees 45 Minutes 42.90 Seconds North Latitude
104 Degrees 17 Minutes 56.50 Seconds West Longitude

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APPENDIX E

NOISE LEVEL REDUCTION GUIDELINES

APPENDIX E

Noise Level Reduction Guidelines

A study which provides in-depth, state-of-the-art noise level reduction guidelines was completed for the Naval Facilities Engineering Command and the Federal Aviation Administration by Wyle Laboratories in November 1989. The study is Guidelines for the Sound Insulation of Residences Exposed to Aircraft Operations, Wyle Research Report WR 89-7. Copies of this study will be made available for review, upon request, from the Environmental Office at the U.S. Air Force Academy.

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